Thomas Weaver pinx. Wm. Ward A.R.A. sc.

Cha... & Robert Colling.

THE

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY

OF ENGLAND.

Third Series.

VOLUME THE TENTH.

PRACTICE WITH SCIENCE.

LONDON:
JOHN MURRAY, ALBEMARLE STREET.
1899.

EXTRACT FROM THE SOCIETY'S BYE-LAWS

(Dating from the Foundation of the Society):—

"The Society will not be responsible for the accuracy of the statements or conclusions contained in the several papers in the Journal, the authors themselves being solely responsible."

CONTENTS OF VOLUME X.

THIRD SERIES.

1899.

Special Articles.

Official Reports.

Notes, Communications, and Reviews.

APPENDIX.

Errata.

In the article on "Flower and Fruit Farming in England.—III.," this volume, Part I., p. 81, first line of second paragraph, for "Fish guano" read "Farmyard manure."

In the same article the name of a pear referred to on several pages as "Hessel" should be "Hessle." It is named after the village of Hessle, in Yorkshire, where it is supposed to have originated.

In the article on "The Trials of Cream Separators at Maidstone," this volume, Part III., p. 529, line 8, for "120° F." read "100° F."

DIRECTIONS TO THE BINDER.

All the pages of text (1 to 788) should come first in the bound volume; and the pages of Appendix (i to cciv) at the end.

Text:—Pages 1 to 216 of the text are included in Part I. (March 31, 1899); pages 217 to 428 in Part II. (June 30, 1899); pages 429 to 584 in Part III. (Sept. 30, 1899); and pages 585 to 788 in Part IV. (December 30, 1899).

Appendix: Pages i to xliv are included in Part I.; xlv to lxxii in Part II.; lxxiii to clxxvi in Part III.; and clxxvii to cciv in Part IV.

Cloth cases for binding can be obtained of Messrs. Spottiswoode & Co., price 1s. 3d.

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY

OF ENGLAND.

THE BROTHERS COLLING.

NEXT to Robert Bakewell, a memoir of whom has already appeared in this Journal,[1] the Collings of Ketton and Barmpton, born a quarter of a century later, are generally regarded as having done the most to improve, and to show how to improve, the cattle of the United Kingdom. In their own special breed, their life-work has achieved a centennial permanence, and a world-wide extension which Bakewell failed to attain with the Longhorn.

There are said to have been three families of the name of Colling in the Darlington district, with no known connection between them. Though there were Collings substantial yeomen at Long Newton in the reign of Elizabeth, and Collings farmers at Barmpton during the Great Rebellion, the direct line of Shorthorn fame has not been certified further back than the double wedding of two sisters, daughters of Ralph Hobson of Kneeton Hall, at the church of Middleton Tyas on May 8, 1715. The younger bride gave her hand to Robert Colling, a tenant of the Huttons at Skerningham, and appears to have brought him a tidy fortune.[2] Their son Charles married Dorothy Robson and had a family of two sons, and two, if not three, daughters. The boys received only an ordinary education: Robert, born about Christmas, 1749, seems to have had no innate taste

[1] *Robert Bakewell.* By Wm. Housman. Journal R.A.S.E., third series, vol. v. 1894, p. 1.

[2] The elder sister married Robert Page, afterwards of School Aycliffe. Her descendants became eventually the nearest known relatives of Robert and Charles Colling. It is to the kind researches of their senior representative, Mr. J. W. P. Page of Norton, that much of the new material used in the present memoir is due.

for farming, and was apprenticed to a large shop in Shields; Charles, born in 1751, derived his first recorded impressions of Shorthorns in his tenth year from a cow belonging to William Wastell of Great Burdon, and James Masterman's bull at Coatham Mandeville. Wastell, then a man of over fifty, had had unrivalled experience as a breeder and feeder; with him "pedigree was everything," a long line of the best ancestors was indispensable if men wished to breed with certainty.[1] The cow, a great milker and a great ox-breeder —"she would be little thought of now," Charles Colling added fifty years afterwards[2]—came from the herd of Croft of Barforth, who was considered, with Milbanke of Barningham, to have the purest breed of Shorthorns on the Tees in about 1740; the bull was "short-legged and thick, with great fore-quarters, but of a hazel colour and spotted like a deer." About the same time Charles and his playfellow, Thomas Ord of Newton Ketton, went over the fields to Stainton Viewley to see the cattle of the latter's uncle, Benjamin Ord, who was a tenant of the Pennymans, and is said to have kept Shorthorns of their celebrated breed.[3]

In consequence of "not having his health," Robert Colling came home from his apprenticeship at Shields. It had been long enough to give him the orderly, business-like habits that distinguished him in after-life. His mind now opened to Shorthorns; he greatly admired the herd that the famous agriculturists Matthew and George Culley (who had visited Bakewell at Dishley in 1762 and 1763) took with them from Denton near Darlington to Fenton in North Northumberland in 1767. He always referred to it as the best collection of Shorthorns he ever saw together, and nearly fifty years afterwards openly stated, "Whatever I know of the art of breeding cattle, I owe to the late Mr. George Culley." Two years later his father took Sir Ralph Milbanke's excellent farm of Ketton (including, it would seem, East Ketton), an area of under 300 acres, on the death of the old tenant, Stephenson, who had come there in 1731 from near Ormesby, the Pennyman place in Cleveland, and had brought with him a good tribe of Shorthorns that had already been some years in his possession.

Ketton stands pleasantly on rising ground above the sluggish

---

[1] Thomas Bell, *History of Improved Shorthorn Cattle*, p. 15.

[2] *Thomas Bates and the Kirklevington Shorthorns*, Redpath, Newcastle, 1897, p. 37. Both this and Mr. Bell's history contain many contemporary notes made at Ketton and Barmpton.

[3] Thomas Ord was one of Robert Colling's executors. His grandson, Mr. John R. Ord of Haughton Hall, has supplied many most interesting facts relating to the Collings from his large collections of local history.

and tortuous Skerne. Although it is only about three miles from Darlington, and not far to the east of the old North Road, it is thoroughly in the country, and seems much cut off from the outer world. During the time it was occupied by the Collings there was no cart-bridge over the Skerne to connect it with the main road, and the only direct communication with Darlington was by the pack-horse causeway, known as "Darnton Trod," which crosses the stream in front of Ketton by a steep and narrow mediæval bridge, and is carried for some distance over the morass by means of flagstones laid on small arches. Johnny Wardell, "the Miser of Ketton," who farmed on the Milbanke estate, used to lead a string of six or eight horses with wheat on their backs to Darlington market, and tie them to whin bushes at the end of the town to save the expense of bait. His standard toast at the tenantry dinners was: "I'll gi'e ye the worthy and respectable gentleman, Sir Ralph Milbanke, Esquire, Knight, and Baron Knight." After the sale of Ketton to the Hardinge family, its present owners, a new, plain, square house was built in front of the remains of the old red-brick one in which the Collings lived, and most of the farm buildings were pulled down and rebuilt at some distance. The present house is almost lost in a large clump of well-grown trees of nearly every conceivable variety. The best pasture is to the west of the house; on a field called Ketton Greens, to the east of it, seven good crops of oats are said to have been raised in seven successive years. Only a small proportion of the Ketton Hall farm, which contains about 175 acres, is now in tillage.

Young Charles Colling worked hard in the fields himself. When he happened to be employed on the East Ketton farm his mother sent his dinner over to him. One day the fare was unusually poor. On his return home in the evening the good woman expressed her regret—"Thou'll not have had a very good dinner to-day, Charles." "Aught's good, mother, when one's hungry," was the contented reply.

Farming became exceeding prosperous during the American War. Charles was not behindhand in the high living and hard riding that this encouraged. After a long run with the hounds on the Yorkshire side of the Tees, he and his friend, Haigh Robson, pulled out their watches and found that it was close on three o'clock, the hour at which they and most of the company were under promise to dine at the Talbot in Darlington. Some-one laid a dozen of port that they would not be in Harrison Thompson's dining-room by the hour fixed. They accepted the wager: their jaded horses were soon clattering across the stone bridge over the Skerne and foaming up Tubwell Row. Crossing

the thoroughfare they scattered the astonished waiters at the door of the Talbot and bounded up the stone steps from the High Row. Along the passage and up the winding stairs Colling and Robson spurred their steeds, and, with five minutes to spare, rode into the dining-room, greatly to the amazement of a party of officers.

The achievements of the "jovial heroes" and their friends formed the theme of a contemporary hunting song composed by Robin Parkin, the mason-poet of Aycliffe :—

> First resolute Haigh Robson, Jehu-like, rode he,
> Likewise his brother Frank, but newly come from sea ;
> And brave old Harry Young, few with him can compare
> In chasing of sly Reynard, or hunting of the hare.
>
> There's Thomas Ord of Newton, for hospitality ;
> Also his cousin Robert Ord much in the same degree ;
> And Anty Dunn of Heworth, so well he loves the game,
> And his brother Harry is a lover of the same.
>
> Charles Colling of Ketton too ; his voice is melody ;
> And Walker of Stanley Farm, for elocution famed is he.

A stranger, of the name of Richardson, had put up at the Talbot with a servant in livery and several good hunters. He talked of his noble relations, and gave out that he held a lucrative "place" under the Government. Appearance and manners were all in his favour. Charles Colling took him home with him, and he soon won the heart of his sister Jane, who, as "the Rose of Ketton," was the toast of the neighbourhood. Richardson pretended that important business demanded his presence in the South of England. A hasty marriage took place in 1775, and the bridegroom disappeared. It then turned out that not only were his bills at the Talbot and elsewhere unpaid, but that he had borrowed considerable sums all round on the strength of his Colling connection. His brothers-in-law honourably paid his debts, but the poor deserted young wife pined away, leaving a son, who only survived her seven weeks. The tragedy probably undermined the health of her mother, who died in 1779 at the comparatively early age of fifty-eight.

Charles's sporting tastes took him to the Richmond racecourse, where he first saw the pretty face of Mary Colpitts,[1] then at a boarding-school at that town. The young lady was the eldest of eight daughters in a family of eleven. Her father, Thomas Colpitts, was, it seems, at that time agent for

[1] Born at Streatlam, Feb. 2, 1763. This and similar facts were derived from Mrs. Copeland, a niece of Mrs. Charles Colling, who died at Staindrop in January, 1899.

the Streatlam estates. His refusal to tolerate the practices of the notorious Stoney Bowes, who had married the Countess of Strathmore, caused Colpitts to be put out of his stewardship, and he retired to a small property of his own at Cockfield. A match with one of his eight daughters thus lost the little it had to recommend it from a worldly point of view. Charles Colling must have been spending very freely; his father's circumstances were becoming embarrassed. It is therefore in every way probable that it was with a view to remove his son from this matrimonial danger that the old man listened to the advice of his good friends the Culleys, and sent him down to Leicestershire in 1782 to spend some time with Bakewell.

It is generally supposed that the great lesson that Charles Colling learnt during the three weeks he spent at Dishley was the expediency of concentrating good blood by a system of in-and-in breeding. This was not a secret that Bakewell confided to his every visitor, and there seems to be some doubt as to the extent to which he carried it into practice himself. The popular idea at that time (if it be not still) was that to effect any great improvement in cattle it was necessary to cross one breed with another. The fact that Bakewell collected specimens of different breeds on his farm for comparative experiments raised suspicions that he introduced admixtures of their blood into his Longhorn favourites. It is singular if so great an experimentalist never did try an alien cross. He told Charge of Newton Morrell, who was perhaps his earliest if not most frequent visitor from the North, that it was from the West Highland heifer that the best breed of cattle might be produced. His dictum that the Devons were incapable of improvement by a cross of any other breed shows that he was prepared to admit the advisability of alien crosses in other breeds, for which the bulls he let and sold must have been largely used, even as far north as Aberdeenshire. However, the results of any such experiments, if he made them, have not been recorded, and there is no reason to doubt his general good faith. George Culley declared that the Dishley cows were invariably bad milkers, but Bakewell appears to have tried to conceal this imperfection. Arthur Young complained that no reliable data, based on experiments, were supplied him to prove the feeding qualities of the Longhorns, as there were in the case of the Leicester sheep.

At the time of Colling's visit Bakewell was engaged in improving his cattle by developing enormous masses of fat over the hip bones and at the end of the hind-quarters. This was a style of "improvement" that Charles certainly did not copy. What he

really learnt at Dishley was the all-importance of "quality" in cattle. Bakewell's Longhorns were rich and mellow to the touch when lean, firm when fat. "Handling" became Charles Colling's guiding principle of selection. The idea that the merit of cattle did not depend so much on size as on compactness of frame, smallness of bone, and readiness to feed, came as a revelation even to a near neighbour of that veteran stickler for pedigree, William Wastell.

Bakewell probably little thought that the love-sick swain he was harbouring under his hospitable roof was destined to improve the "patches"—as he contemptuously called the Shorthorns he kept as foils to bring out in higher relief the merits of his Longhorns—in a way that should bring the latter to the verge of extinction. It says much for Colling's foresight that he withstood, so far as we know, the temptation of taking north with him any specimens of the noble and (whatever its origin) typically English breed then in the height of fashion. He resolved to devote himself to the preservation and amelioration of the local cattle on the Tees and Skerne. George Culley had seen the opportunity, but had somehow failed to seize it. He attained no celebrity as a Shorthorn breeder in Northumberland, but like Bakewell was successful with his sheep.

Absence in Charles Colling's case seems to have made the heart grow fonder; on his speedy return home he became definitely engaged to Mary Colpitts. It was arranged that he should take over Ketton, his father retiring to Skerningham. Robert Colling, who had been living at Hurworth, now entered on the excellent farm of Barmpton, under the Lambtons, on the death of Brian Harrison, the former tenant. He had no thought of becoming a breeder of Shorthorns, and only kept dairy cows. He purchased from Alexander Hall, of Haughton-le-Skerne, probably because their dam was known to have given 36 quarts of milk a day, two Shorthorn heifers descended from a cow (said by some to have been of the old Stephenson stock at Ketton) to which William Wastell had given the elegant name of "Tripes" in 1760. One of these heifers became the ancestress of his Princess tribe, the other he fed off and sold extraordinarily fat. His sister Dorothy had come to live with him in the long, red-brick house overlooking the narrow dell with its bridge over the Skerne. She told him that the milkmaid had repeatedly spoken of the wonderful quantity of milk given by one of the cows. One Sunday evening she happened to mention it again before the cows were milked. "Let us go," said Robert, "and see the cow milked; we can then measure the milk and see what she really gives." The servants knew nothing of their

intention, and as the milkmaids were not in the habit of getting up early on a Sunday morning, twelve hours could not have elapsed since the morning milking. After seeing the cow milked, they found she had given twenty-six quarts and a half, ale measure, that evening alone.

On Christmas Day 1782 Charles dined with his brother; Robert Waistell ("Squire Waistell," who spent his nights in card-playing, and came at last to the workhouse) the tenant of Elly Hill, the farm, then belonging to the nieces of Cuthbert Ellison, of Durham, just south of Barmpton, on the other side of the Skerne, was also present. After dinner Robert Colling asked Charles if he knew of a bull that would do to serve his cows and Waistell's until a large bull-calf they were rearing was fit to use, their ideas of the merits of cattle depending entirely on their size. Charles told them of a little yellow-red and white five-year-old bull belonging to William Fawcett that he had seen in a field at Haughton Hill on his way to church. He thought that he might be bought for very little, and sold again without loss when they had done with him. His brother and Waistell then asked him to buy the bull for them, and he did so for eight guineas.

On July 23, 1783, Charles Colling was wedded to Mary Colpitts before the three lancet windows of the little old church of Cockfield. The Christmas following the young couple dined at Barmpton. Waistell was again there, and in the course of the afternoon Robert Colling told his brother that as their large calf had now grown up, they no longer required the little bull he had bought for them, and asked if he could find a customer for him; the bull took offence at a grey pony he rode and began to be troublesome. Charles inquired the price they wanted. Both agreed that they would be content with prime cost, whereupon he said they might send him over to Ketton. Some time elapsed and no bull appeared. Charles began to think that his brother and Waistell had found out his value and intended keeping him. One day, however, on returning from an absence of some duration he found the bull had arrived. He took his young wife out to look at him, and did not hesitate to pronounce him "better than any bull he had ever seen." His handling was excellent, his coat soft and downy; the rump and hips extraordinary, the girth good, the quarters long and straight; the breast, flank, and twist of great size, the horns small and fine, clean and waxy; the eyes mild and bright; and he had a very pleasing countenance. Shortly afterwards Waistell sent a cow to be served by him. Colling told the man he might leave the cow and go home to inform his master that the fee was five

guineas, and that he would take nothing less. The answer, naturally enough, was that Waistell would not pay five guineas for a service by a bull, his half-share in which he had just sold for four.

Having now a bull to his mind, although he did not give him a name—the famous name of Hubback—till after he had sold him, Charles Colling began casting about for good cows. On June 14, 1784, he bought in Darlington market what he considered the best cow he had ever seen, from Thomas Appleby of Stanwick, for 13*l.* Her handling was very superior; she was a massive, short-legged animal, of a beautiful yellow-red roan; her breast was near the ground, and her back wide. Appleby was a tenant of the Duke of Northumberland, and at Ketton the cow received the name of Duchess. About this same time Colling bought a cow he called Daisy at Brafferton, a village a mile or so to the north of Ketton. She was "an animal very neat in shape and very inclinable to make fat." He had no doubt she had a cross of his early acquaintance, Masterman's Bull (422, 670). From Alexander Hall, of Haughton-le-Skerne, he purchased a heifer, descended, like his brother Robert's pair, from the celebrated Tripes. This heifer, known as Haughton, was by Hubback, and her excellence confirmed the good opinion Colling had formed of him as a sire.

In September 1784 old Charles Colling of Skerningham won at Darlington the "reward" of three guineas offered by the newly established Society for the Encouragement of Agriculture in the County of Durham, for the "best breeding cow in milk, to be kept two years afterwards in the county"—probably with the ancestress of Punch (531). Robert Colling received a similar sum for the best tup, with "one now engaged for the autumn season by Mr. George Coates, of Haughton, butcher." The two brothers were elected members of the Durham Society in December.

The father of "the Collings" died at the age of 64, and was buried in Haughton churchyard on March 18, 1785. That same month his son Charles won the five-guineas prize for the best bull at Durham with his eight-guineas purchase. It must be remembered that the bull classes at Durham were open to all breeds, and the Shorthorns had to contend against all comers.

Far from approving as yet of in-and-in breeding, Charles Colling seems to have sent the neat, fine heifer Haughton by Hubback, which he had bought of Alexander Hall, to Richard Barker's bull at Oxenfield, in order to avoid a second cross by Hubback. Barker's bull was a great, good-shaped, dark red-roan, but is said to have been coarse and wiry-haired, with a

THE OLD SHORTHORN COUNTRY

"When you reach that fine country on both sides the river Tees you are then in the centre of the short-horned breed of cattle."—GEORGE CULLEY, 1786.

large head, dark horns, and a black nose. The produce of Haughton's visit to Oxenfield was the white calf with a few red spots, afterwards known as Foljambe (263).

The following year Gabriel Thornton, a brother of "Mr. Robert Thornton, Robert Colling's man," entered Charles Colling's service as bailiff. He had lived for eight years with John Maynard of Eryholme. He mentioned the fine cattle at Eryholme to his new master, and on September 30, 1786, Colling and his wife rode over to see Maynard's herd. A seven-year-old cow that Maynard's daughter is said to have been milking claimed their admiration, in spite of her horns "nearly a yard and a half long."[1] After some haggling on Colling's part, which his wife bore very impatiently, Maynard agreed to part with the cow for twenty-eight guineas. She had been previously known as Favourite; Colling gave her the name of Lady Maynard. She was descended from a "black cow with a white belly and white legs to the knee," the daughter of a "gray-coloured cow" that Maynard remembered at Eryholme as a schoolboy in 1750. The change for the better had mainly been effected by a cross of a dark red bull "with black-brindled intermixed" (337), bred by William Wastell in 1770.

By what he himself admitted to have been an extraordinary error of judgment—his first and his most fatal—Charles Colling, discouraged by fashion running more on size than on "quality," sold Hubback (319), then ten years old, for thirty guineas to "Mr. Hubback, near Newbiggin, in Northumberland,"[2] on October 28, 1787. He had put him to Duchess, Daisy, Cherry, and Lady Maynard, whom many thought the four best Shorthorn cows in existence. Four beautiful heifer calves followed; the white one from Lady Maynard, which Colling especially admired, met with an accident and died as a two-year-old. He sold Hubback's son Foljambe (263) to George Coates for Mr. Foljambe for fifty guineas, on December 14, when he was twenty months old. Hubback had left at Barmpton a calf from Thomas Hall's heifer that grew up into "a little red-roan cow"; but only one of his calves besides Foljambe seems to have been spared as a bull at Ketton and only two at Barmpton, the red-roan Broken Horn (95), and Robert Colling's yellow-roan Lame Bull (358). Charles's dread of in-breeding seems still to have been so strong, and so little store did he set on Hubback's blood, that he exchanged his young

[1] Hutchinson, *Origin and Pedigrees of the Sockburn Shorthorns*, p. 49.

[2] Probably Mr. William Huggup of Spital House, near North Seaton. The name "Huggup" is locally pronounced "Hubbuck" in Northumberland, just as "Maughan" is "Maffin;" "Hodgson," "Hodgin," etc.

bull by him with George Best of Manfield for Lame Bull (357), giving seven guineas into the bargain. With what bull or bulls Robert was second at Durham in 1787, and first in 1788, does not appear.

Dorothy Colling's management of her brother's household at Barmpton won the admiration of the neighbourhood. An early version of the Friend's matrimonial advice in Tennyson's "Northern Farmer," is contained in an extract from a letter dated May 4, 1788:—

> Thy cousin, Robert Colling, is a man of great abilities, and his sister, Miss Doe, is a worthy woman; perhaps thou mayst have the pleasure of seeing her here. A good wife is no worse for having an immense fortune. At least it is valuable in old age, and will keep the wolf from the door.

Alas for the vanity of human calculations! Poor Doe Colling was seized with rapid consumption, and about four months after this letter was written she was laid to rest, at the early age of twenty-six, beside her parents and her unfortunate sister in the churchyard of Haughton-le-Skerne.

In November 1788, Lady Maynard's daughter, Young Strawberry, dropped at Ketton a beautiful calf, blood-red with a little white, to Foljambe (263). It received the name of Lord Bolingbroke (86), and grew to be the best bull Coates ever saw, "cleanly and neat, though inclined to be podgy and rather low-sided." Colling too must have admired him, since getting him can have been the only "most good" that, as he told Coates, Foljambe (263) had done him of any "beast;" but though he kept Bolingbroke eight years he used him very little.

A five-year-old ox, bred and fed by Milbanke of Barningham, was still the great wonder of 1789. Its weight of over 177 stones, about the same as that of each of Sir Henry Grey's seven-year-old oxen, fed at Howick two years before, was considered to mark a great improvement. That same year General Watson of Aberdour, in Fifeshire, bought Princess by Hubback, a heifer of the same tribe as the great cow sold by Thomas Hall of Haughton to the Duchess of Athole, probably the first Shorthorn to cross the Tweed. In 1790 Charles Colling was again first with bulls at Durham; he sold his first two yearling bulls that year at Darlington, one (148?) to John Coates of Smeaton for 26*l.*, and the other to R. Thomas of Eryholme for 23*l.*; the latter won the first prize at Durham three years later. In April 1791 Charles sold Lame Bull (357) to Robertson of Ladykirk. He now had recourse to three bulls at Barmpton—Broken Horn (95), Punch (531), and Ben (70)—whose origin is almost as great a mystery as that of the "three

kings who were the sons of strangers," that are pitchforked into Welsh history in the seventh century. The double-cross of Hubback given to Broken Horn (95) by Coates in his Herd Book is an evident mistake. Charles Colling was positive that neither he nor his brother ever put a daughter to her sire until they used Favourite (252), and the whole history of his breeding operations confirms this. Punch (531) is said really to have been out of an ordinary cow that had belonged to old Charles Colling, and his produce to have shown Kyloe characteristics. There is strong independent evidence handed down from father to son that Ben (70) was bought at Stainton Viewley from the stock of Benjamin Ord. One thing, and only one thing, seems certain, that is that whatever their origin neither Broken Horn (95), Punch (531), nor Ben (70) effected any marked improvement in the Barmpton or Ketton herds. Indeed at this juncture Charles Colling seems to have despaired of improving his Shorthorns any further without the introduction of some alien blood. His neighbour, Colonel O'Callaghan, of Heighington, had bought two red Galloway heifers, and Charles allowed them to be served in 1791 by Lord Bolingbroke (80) on the express condition that if there was a bull calf he was to have it. The half-bred O'Callaghan's Son of Bolingbroke (469) accordingly came to Ketton and was not steered. Still the brothers Colling swept the boards at the Durham shows in 1792, Charles being first in the bulls and the cows, and Robert in the heifers. The next year they were appointed two of the judges, and therefore did not show themselves. It seems doubtful if their decisions gave satisfaction; in 1794 they were requested not to show, and the extraordinary step was taken of appointing all the members of the Durham Agricultural Society present to be the judges.

A "shyness" that had sprung up between the two brothers became so developed in March 1793 that when Mrs. Colling sent "her cow" Phœnix to be served by Ben (70) at Barmpton, Robert told the man: "I wonder your mistress should send a cow to my bull." There was nothing for it but to drive Phœnix back to Ketton. On her arrival, in order that she might have a calf of some sort, she was put to Lord Bolingbroke (86), although he was both her half-brother and her nephew. It was thus more than ten years after Charles Colling had paid his celebrated visit to Bakewell that he put in practice a system of close in-breeding among his Shorthorns. Even then his doing so, far from being intentional, was the accidental consequence of his strained relations with Barmpton. The experiment resulted in the birth of the light-roan bull Favourite (252) on

December 15, 1793. Favourite grew to be a large, massive animal of good constitution, with a fine bold eye, remarkably good loins, and long, level hindquarters. His shoulder points stood wide, his horns were long and strong—points that he is said to have inherited from the Blackwell herd, from which his double great-great-grandsire sprang.

Some little time after Phœnix's fruitless visit to Barmpton, an old dark red cow with a whitish face, by Lame Bull (357), called Johanna (afterwards sold, it seems, to "Jefferies Ward of Willerby, near Scarborough"[1]), which had not bred for two years, was put as a last resort to the half-bred Son of Bolingbroke that had come from Heighington (and was soon afterwards sold to Major Cartwright[2]). She produced in 1794 the calf Grandson of Bolingbroke (149, 280) with a fourth of Galloway alloy in its veins. The two diametrically opposite experiments of in-and-in breeding and of introducing an alien outcross were made by Charles Colling practically at the same time. They were experiments in the fullest sense of the word, being bow-shots drawn at a venture without any fixed aim previously determined by theoretical considerations. Of the resulting calves Favourite won the first prize at Durham in 1796, and became a most celebrated bull, the predominant factor in every Shorthorn pedigree; Grandson of Bolingbroke was only placed second there, March 31, 1797, and was then sold to "one Marshall, near Burlington;"[3] he was never used to any good cow at Ketton except Phœnix, who, like old Johanna, had turned a shy breeder. The immediate issue of the experiments cannot therefore be said to have been doubtful. The Collings accepted it as conclusive; they became enthusiasts in in-breeding, and were never known to try another alien outcross: "it was Favourite! Favourite! Favourite! to the end of countless generations."[4] The alloy—at the very most an alloy of one-sixteenth—was confined by them to the descendants of Lady, the daughter of Phœnix by Grandson of Bolingbroke (herself seven-eighths Shorthorn, one-eighth Galloway). Only the Rev. Henry Berry had the hardihood to allege that the introduction of the alloy was the great improvement effected by Charles Colling in Shorthorn breeding, and was part of an intentional plan. Those who were best acquainted with the extraordinary amount of heterogeneous blood that Shorthorns had absorbed since the fourteenth century—the Kyloe grey, the Dutch black and white, the Longhorn brindle, the Hereford white face, the Alderney yellow, and the primæval

---

[1] MS. note by Thos. Bates on the Ketton catalogue.
[2] *Ibid.* [3] *Ibid.*
[4] Hutchinson, *Origin and Pedigrees of the Sockburn Shorthorns*, p. 45.

white betraying themselves in most early pedigrees, especially in that of the tribe to which Lady belonged—could afford to consider a dash of the red Galloway a very venial matter. The only question with them was, Was it an improvement? Their answer was that Lady was a sleek, fat-rumped cow, giving very little milk, and lacking hair and handling.[1] The lack of hair certainly did not come from her Galloway ancestry, and they were disposed to attribute it and her other defects to bad Shorthorn blood that lurked in her granddam Johanna.

Charles Colling began using Favourite when he was barely twelve months old. On September 11, 1795, his first calf, a roan heifer, was dropped by a Duchess heifer by Hubback, and on October 5 his second, a roan bull (which grew to be the famous Durham Ox), by a daughter by Hubback of the "Stick-a-bitch Cow."

Lord Bolingbroke (86), the excellent sire of Favourite, of whom the Collings had made little or no other use, was sold as a vigorous eight-year-old in 1797 to William Jobling of Newton Hall, Northumberland, for 70 guineas. The stock he left, with their red bodies and white faces, greatly resembled Herefords.

The celebrated Lady Maynard, whom Charles and Mary had bought on riding to Eryholme twelve years before, was sold at Darlington Great Market in the opening of 1798. There were two young cows sold with her at twenty guineas each, but the old cow, though she was nineteen years old and had bred twenty calves in all, was still lively and fresh-looking—many said a far better cow than any bred from her that grew to maturity. The next year the same Great Market witnessed the triumph of the issue of the bull that was both her grandson and her great-grandson. The traditional eight steers and eight heifers furnished from Eryholme were forgotten; the crowd gathered round the roan ox and the roan heifer, the first-fruits of Favourite (252). No animals had ever before been seen so good at that age. The memories of the seven-year-old oxen at Howick and the five-year-old Barningham ox were eclipsed by the Ketton three-year-olds. Thompson of Stamford, in Bamburghshire, a well-known judge of stock from Northumberland, was thrice found lost in admiration beside the Duchess heifer. A beautiful roan in colour, she was admitted to have the most perfectly shaped and uniformly covered frame of beef, equally good in every point, her breast the nearest the ground of any animal ever seen. She was more weight than the ox then, and on being sold

[1] On the other hand Lady is said to have "lacked elegance" but to have had "great substance and good hair."—*Thornton's Circular*, i. p. 239.

and killed scaled 1,394 lb. Often afterwards did Charles Colling say with regret, "It was the heifer I ought to have kept for exhibition." As it was, he took the ox home and continued feeding him to attain the greatest weight possible.

A young man from Tyneside who saw the two animals was so struck by them that, on entering a large farm in the spring following, he paid Charles Colling the first hundred guineas ever given for a Shorthorn cow. The heifer in question seems to have been a daughter of Venus by Ben (70) and a great-grand-daughter of Lady Maynard.

> It was this price, then deemed incredible, that brought the Colling stock into great repute. Every newspaper was trumpeting the marvellous wonder, and every gentleman who wished to begin improving his herd went to the Collings for a bull, till it came to be considered a great favour to get one from them. . . . Everyone who talked of Improved Shorthorns now set his affections on those of the Collings; . . . the "dons," who were able and willing to give high prices, flocked to Ketton and Barmpton.[1]

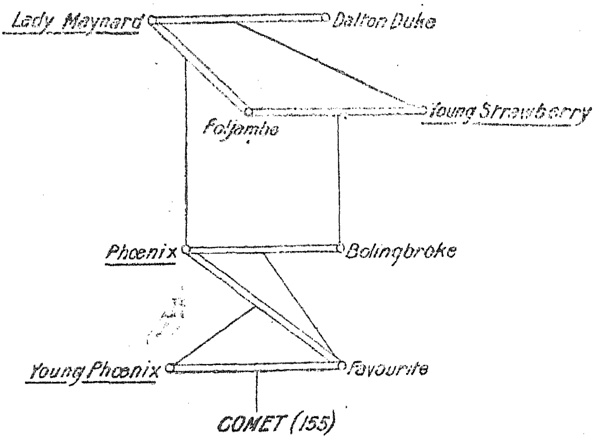
Old breeders who recollected the best Shorthorns before Hubback's day, and were well acquainted with their descendants, gave it as their opinion, after viewing the now four-year-old Ketton or Durham Ox, that the most perfect animals would be those bred from Hubback cows to a Favourite bull. Sir Henry Vane Tempest of Wynyard—"an admirable judge of the points and excellencies of the whole animal world, from a race-horse or a Shorthorn down to a game-cock"—was so struck by Robert Colling's Princess heifer thus bred (with a second cross of Favourite) that he determined to buy her at any price. The sum paid was kept a secret, but *omne ignotum pro magnifico*, and rumour had it that it was 700 guineas. Seventy or a hundred guineas is more probable. A Red Rose heifer, with crosses of Foljambe (263) and Punch (531) intervening between Hubback and Favourite in her pedigree, was sold by Robert to Hustler of Acklam, and taken to America and back by his son.

In February 1801 the Durham Ox had attained the weight of 3,024 lb., and was sold to Bulmer of Hornby as a show animal for 140*l.* Bulmer had a van made for him, and after a tour of five weeks sold them both to John Day of Harmston, near Lincoln, for 250*l.* In July Day refused 2,000*l.* for his bargain, and for six years trailed his "Wonderful Ox" through the principal parts of the island. In London he took 97*l.* in one day. A portrait of the ox, painted by J. Boultbee and engraved by J. Whessell, was published by Day, March 20, 1802, and dedicated to Lord Somerville. At ten years old the ox scaled about

[1] Bell, p. 183.

3,800 lb., but dislocating his hip bone he was killed at Oxford in April 1807.

The crowning triumph of Charles Colling's breeding was the production of Comet (155), born in the autumn of 1804. He was a beautiful light roan with a dark neck; a sprain he received as a calf is said to have caused his near shoulder to shrink. His breeding was very close; a diagram will illustrate this best, and serve to show the extent to which in-breeding was carried at Ketton:—



Double bars for services ═══ Single bars for produce ———

Cows' names underlined.

Comet was the produce of daughter and sire; his dam the produce of dam and son; his sire practically the produce of brother and sister, for Bolingbroke had only less than three-sixteenths of blood derived through Dalton Duke that was not common to Phœnix. Charles Colling declared Comet to be the best bull he ever bred or ever saw, and nearly every judge of Shorthorns agreed with him. "He had a fine masculine head, broad and deep chest, shoulders well laid back, crops and loins good, hind-quarters long, straight and well packed, thighs thick, twist full and well let down, with nice straight hocks and hind legs. He had fair-sized horns, ears large and hairy, and a grandeur of style and carriage" that baffled description. The only things critics found to carp at were the knuckles being a little strong and the near shoulder disfigured; some attributed this disfigurement to disease consequent on his close breeding.

At Christmas 1804 Charles Colling sold Duchess by Daisy Bull (186) to Thomas Bates for 100 guineas. Her daughter by Favourite (252) was sold with her for 60 guineas, but Mrs.

Colling importuned her husband to request her surrender. Bates had reluctantly to consent; a note in his pocket-book shows the rates at which rams and bulls were being let by Robert Colling at the time:—

December 26, 1804. Took a three-shear tup by Points (let two years to Mr. Barker) for thirty guineas, and another at forty. . . . To have the bull Mr. Seaton has for 1806 at forty guineas.

Styford (629), who had been hired by Bates, and the Grey Bull by Hustler of Acklam had both returned to Barmpton. Charles Colling, on being asked to give his opinion of their merits, acknowledged that for once his fingers had been mistaken in the first instance, and that the Grey Bull, whose sire was bred direct from Hubback to Favourite, was the better handler.

The Shorthorns had still not established their supremacy in the county of Durham:—

In the autumn of 1805, Mr. George Taylor of St. Helen's, Auckland, went purposely into Devonshire to procure the best of the Devon breed he could find; for this purpose he traversed the whole county, and selected ten cows and a bull. . . . Mr. Shafto of Whitworth has also procured five cows and a bull from the north of Devonshire; the bull is of a good straight form, and a better handler than most of the breed. Mr. Shafto has also a small Kyloe cow, bought of Mr. Bates of Halton, which for real good handling is scarcely to be surpassed. About three years ago Mr. G. Baker of Elemore got some Devon cows from near Bath, and a French bull said to have been an excellent one; but he is now breeding from improved Shorthorns. Mr. J. Hopper of Witton Castle procured twelve cows and two bulls of the Herefordshire breed, but finding them bad milkers, he sold them to Mr. William Salvin of Croxdale.[1]

In the autumn of 1806 Charles Colling sold the roan heifer Mary to General Simson of Pitcorthie in Fifeshire for 300 guineas. General Simson also purchased North Star (458), full brother of Comet, who went to Scotland as a year old in February 1807.[2] Their sister, born in 1805, had died as a calf. North Star was a little lighter in colour than Comet, but fully as fine in quality; perhaps rather thicker, but not so perfectly elegant. He died at Pitcorthie in 1811.

No subsequent calf indeed could be compared to the symmetrical Comet, whose birth was the high-water mark attained at Ketton. There were even those who whispered that a retrograde movement was to be noticed in the herd. In consequence of the heterogeneous ancestry of the material used, no ill effects had resulted from the persistent system of in-breeding that were not counterbalanced by improvements in shape and quality,

[1] Bailey, *General Survey of the Agriculture of the County of Durham*, 1810, pp. 238–241.

[2] MS. note by Thos. Bates on the Ketton catalogue.

but the time had come when Charles Colling must have felt that he ought either to obtain fresh blood from elsewhere or to part with his herd. As he was close on sixty he chose the latter alternative.

The time was very propitious for a sale; the peregrinations of the Durham Ox had advertised the name of Colling far and wide, and prices were inflated to nearly double their normal average in consequence of the Napoleonic wars. Early on the bright morning of October 11, 1810, "people rode and drove to Ketton, leaving their horses and gigs at the adjoining farms. All the strawyards were full, and the throng at the sale was immense; everything was eaten up, so that bread had to be sent for into Darlington. Kingston, the auctioneer, sold the cattle by the sand-glass, and in accordance with the custom of the time received about five guineas for the business, the work of the sale falling more on the owner than the auctioneer."[1]

The order of the sale was peculiar: neither the cows nor the bulls were arranged either according to their age or their families; the bull calves formed a separate class, and were followed by the heifers and the heifer calves. Cherry, calved in 1799, was the first cow to enter the ring, and, though a plain red-and-little-white, sold for 83 guineas. Most people considered Countess ($\frac{1}{16}$ alloy) the finest cow in the sale; her back and underline were nearly parallel, but she wanted hair and milk. Her daughter Selina ($\frac{1}{32}$ alloy) had the same style, but not the same magnificent appearance. The fourteen-year-old Lady ($\frac{1}{8}$ alloy) had great substance, but lacked elegance. The splendid white Lily by Comet was secured by Major Rudd at 410 guineas, the highest price paid for cow or heifer. Her dam Daisy, a small roan cow, but a great milker, went to Welham, near Malton, at 140 guineas, and proved much the better bargain. Cora, out of the 400 guineas Countess, had a pretty red frame, but ugly cock horns, and was knocked down at 70 guineas. Red Rose was out of Eliza, but the catalogue did not say that Eliza was out of a Kyloe got from Thomas Bates in 1801.[2] Magdalene, the last of the cows, was a little red cow with a large bag and short quarters; she was not first-rate, and wanted hair.

And now came the hero of the day, the beautiful Comet, "not very large, but with that infallible sign of constitution—a good wide scorp or frontlet, a fine placid eye, a well-filled twist, and an undeniable back."[3] He was put up at 600 guineas. Thomas

---

[1] The account of the Ketton and Barmpton sales is principally founded on the excellent articles in *Thornton's Circular*, vol. i. pp. 237, 510.

[2] MS. note by Thomas Bates on the Ketton catalogue.

[3] Dixon, *Saddle and Sirloin*, p. 146.

Newton, a small dairyman of Bishop Auckland, bid 850 guineas. "John Wright, standing beside him, asked why he bid. 'To take in cows at a good profit,' was the answer, and while they were talking, the glass ran out at 1,000 guineas ;" the purchasers being a syndicate of four. The old bull Yarborough, calved April 3, 1801,[1] followed, and made only 55 guineas ; the still older Cupid, calved Christmas 1798,[2] being rather lame, was not offered. Buyers recovered their spirits with Major (397), a nice red and white bull, but not particularly handsome; Coates thought him "fair." Petrarch (488), a splendid-looking animal, but wanting hair and too short in the horn, brought 365 guineas, the next best price to Comet in the bulls.[3] Northumberland (464), and the bull calf Ketton (346), "bad in girth," both showed too strong knuckles. Albion (14) was "mellow, not good," but, bought by Thomas Booth for 60 guineas, proved himself the best sire ever used at Killerby. Cecil (120), the last bull calf, made nearly three times Albion's figure, but his sides were too flat, and Coates subsequently pronounced him "as plain a dog as I ever saw."

Among the heifers Thomas Bates had set his affections on the fine red-and-little-white Young Duchess, and had agreed with the auctioneer that he was to go on taking his bids as long as he held up his umbrella. Her price, 183 guineas, was second to that obtained for Young Countess, a thick stylish red. Robert Colling bought Charlotte ($\frac{1}{64}$ alloy), a purchase that confirms the truth of the opinion attributed to him that "there was nothing much better than another in Charles's herd, unless it might be the Phœnix tribe," an opinion so carefully guarded as to sound like the celebrated order that his uncle Ralph Colling gave for hammers at Darlington, "all of a size, but the ones a little larger than the others." Sir Henry Vane Tempest, who had been delayed, drove up just in time to secure Callista, the last lot but three of the eight-and-forty. His mortification at having missed Comet was intense; he declared that he would willingly have gone to 1,600 guineas for him.

The 47 lots sold produced 7,116*l.* 18*s.* 0*d.*, an average of 151*l.* 8*s.* 5*d.* Including the partners in the purchase of Comet, there were 32 purchasers, arguing a wide dispersion, but with

---

[1] MS. note by Thomas Bates on the Ketton catalogue. [2] *Ibid.*

[3] Petrarch was the sire of Hutchinson's Herod (307), shown at Darlington in April, 1814. There was some misunderstanding as to the hour of the judging, and when Hutchinson brought his bull to the usual place before the King's Head Inn at one o'clock, all was over. He met Charles Colling, who looked at the bull and laid his hands on him, asking "How is he bred?" "Got, sir, by your bull Petrarch." "And, sir, he does him no discredit."—*Origin and Pedigrees of the Sockburn Shorthorns*, p. 35.

the exception of Mr. Grant from Lincolnshire, they all came from Durham, Yorkshire, or Northumberland. Thirteen "bull calves' nurses and heifers not bred by Mr. Colling," but all served by Comet, were sold at an average of 20*l.* 14*s.* to Sir Henry Vane Tempest, Mr. Champion, and other noted breeders. The sheep sold next day included 19 rams, 100 breeding ewes, and 150 gimmers and gimmer lambs, and raised the grand total of the sale to 8,642*l.* 11*s.* 0*d.*

"The only cow that Charles Colling reserved was Magdalena,[1] a great favourite," calved, according to the Herd Book, in 1809; she became "an extraordinary milker, giving sixteen quarts twice a day. Whitaker prevailed upon Charles Colling to let him have her."[2] Mrs. Charles Colling had a two-year-old heifer in calf out of a West Highland Kyloe that Thomas Bates had given her. This was reserved from the sale, and her husband refused 100 guineas for her on the evening of the second day's auction.[3]

After this most successful sale, Charles and Mary retired to live at Monkend, near Croft. A testimonial followed, in the shape of a silver-gilt cup[4] with the inscription :—

PRESENTED TO
MR. CHARLES COLLING
THE GREAT IMPROVER OF THE SHORT-HORNED BREED OF CATTLE
BY THE BREEDERS
WHOSE NAMES ARE ANNEXED
AS A TOKEN OF GRATITUDE FOR THE BENEFIT THEY HAVE DERIVED
FROM HIS JUDGMENT
AND ALSO AS A TESTIMONY OF THEIR ESTEEM FOR HIM AS A MAN
MDCCCX.

The names of the subscribers, forty-nine in all—one name is absent to make up the fifty—were arranged in counties inside the cover :—

NORTHUMBERLAND.

George Culley
Wm. Spoors[5]
Thos. Gibson
Wm. Donkin
John Loraine
John Bailey
Wm. Smith of Togston
Thos. Jobling
Ric. Jobson
Anthony Compton
Sir Charles Loraine, Bart.
William Smith of Heyfarm[6]
Rob. Thompson

---

[1] Not to be confused with Magdalene, p. 18, above.
[2] *Thornton's Circular*, vol. i., p. 239.
[3] Letter of Thomas Bates to John Bailey, October 23, 1810. *Thomas Bates and the Kirklevington Shorthorns*, p. 112.
[4] This cup is now in the possession of his Honour Judge Granger, Tregurrian, Falmouth, who has kindly verified the inscription.
[5] Of Little Swinburn.
[6] Near Ford.

YORKSHIRE.

Rev. Thos. Harrison	*Thos. Hustler*
Jno. Maynard	*John Wharton, M.P.*
Thos. Davison	*Hen. Strickland*
Jno. Hutton	*Thos. Lax*
Thos. Booth	*Wm. Poole*
Anthony Bell	*Hen. Witham*
Barthw. Rudd	*Thos. Barker*
Thos. Charge	*Rob. Harrison*
Ch. Wright	*R. Ostler, Lincolns.*

DURHAM.

Chris. Mason	*R. C. D. Shaftoe*
John Trotter	*R. Colling of Hurworth*
John D. Nesham	*Wm. Greenwell*
John Wetherell	*Thos. Arrowsmith*
Wm. Taylor	*Jos. Walton*
Sir H. V. Tempest, M.P.	*Arthur Mowbray*
Ra. Jno. Lambton, M.P.	*John Aiskell*
Jas. O'Callaghan, M.P.	*Wm. Alder of Horncliff* [1]
Wm. Beckwith	*R. Colling of Barmpton*

To say the least of it, the inscription was in bad taste: its exclusive attribution of the great improvement of short-horned cattle to Charles has been likened to "the defrauding Esau of his birthright." [2] Robert's nature, however, was too noble to take umbrage at this himself.

A bomb-shell exploded when Colonel Mellish read out a letter at the King's Head at Darlington to say that Mr. Mason "did not recollect any experienced breeder who made an offer for the mixed breed at Ketton, and that he was sure that if Charles Colling had not made that mistake, his stock would have sold for some thousand pounds more." People began asking what was meant by "the mixed breed," for no mention of the Galloway descent in Grandson of Bolingbroke (280) had been made in the catalogue, any more than of the West Highland descent in Eliza. Some went so far as to say that if they had known of the transaction they would not have been purchasers. Mason's opinion is said to have been fully endorsed by Robert Colling, in spite of his purchase of Charlotte.

Barmpton henceforth becomes the centre of interest. A white free-martin heifer, already mentioned in the autumn of 1808 "as surpassing any animal ever yet seen for fat," was now estimated to weigh at four years old 1,820 lb. She was considered "a perfect counterpart of Charles Colling's ox, being, like him,

---

[1] On Tweed, North Durham.

[2] Allen, *History of the Short-Horn Cattle* Buffalo, 1872, p. 94.

completely covered over her whole carcass with fat." In their portraits no two Shorthorns could have less in common: the ox is admirably proportioned, the fat being evenly laid on over the whole frame; the heifer, except for her fine head and legs, is a lumpy monster. We see her in her favourite corner of the fold at Barmpton, with the watering-trough, and the round plastered brick pillars, and Abel Storey in his soft felt hat, blue check blouse, and buttoned breeches and leggings, slicing with his knife her ration of turnips into the wicker basket, with a benign gravity of expression worthy of the episcopal bench.[1] Robert Colling, who was fond of children, would often place Mary Thornton for a ride on her broad back. Purchased by two butchers, Robinson and Spark, she set out on her travels, but in spite of the loud advertisement of her being by the same sire as the thousand-guinea Comet, she does not seem to have made a sensation equal to that caused by the Ketton ox. At Christmas 1811 she appears to have been exhibited at the stables of the Three Kings, Piccadilly, as "the greatest wonder of the world of the kind," and then weighed 2,448 lb. Favourite (252) was both her sire and her grandsire; her grandam was the Yellow Cow by Punch, "remarkable for the width between her hips, and for a magnificent frame, united with inclination to fatten."[2] Sir Henry Vane Tempest had bought Tragedy of this "the old Yellow tribe" privately from Robert Colling.

There were three other favourite tribes at Barmpton: the Wildair tribe came, Robert believed, from the stock of Sir William St. Quintin of Scampston, the same source as Hubback (319); the Red Rose tribe, the first of which, Red Rose by James Brown's Old Red Bull (97), he had bought from Mr. Watson of Manfield about the same time that Charles bought his Duchess, by the same sire, from Mr. Appleby; and the Punch tribe, said to be really descended from the stock of old Charles Colling, possibly from the cow with which he gained the first premium at Darlington in 1784.

The same system of in-and-in breeding that had been in vogue at Ketton was pursued without interruption at Barmpton, and that without any admixture of fresh alloy. Robert Colling had given it as his private opinion that the best breed of cattle might be produced by crossing good

[1] The picture of the White Heifer at seven years old by Thos. Weaver was engraved by Wm. Ward, "Engraver extraordinary to their R.H. the Prince Regent and the Duke of York," and published Dec. 13, 1811, by W. Robinson, Darlington, with a dedication to Robert Colling.

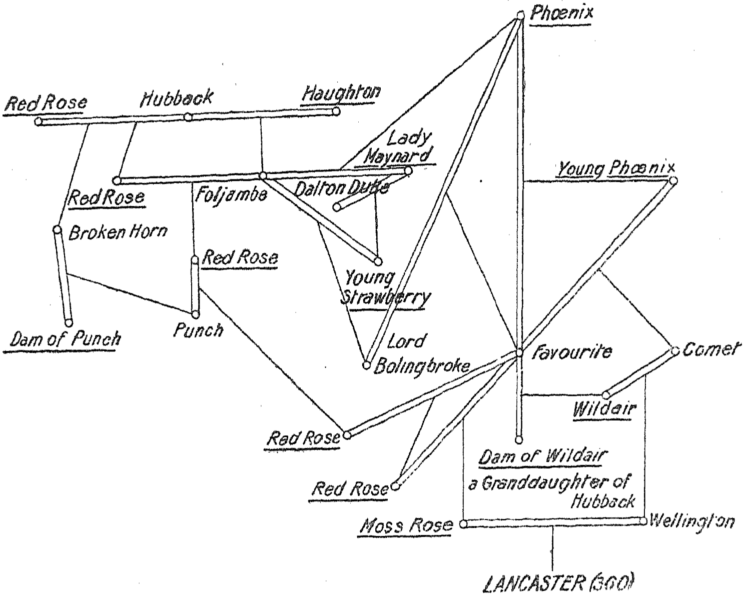
[2] Rudd, *An Account of some of the Stock of Short-Horned Cattle of Charles Colling, Esq., of Ketton &c.*, Stockton, 1821, p. 17.

Kyloes, if they could be obtained, with Shorthorn bulls; he had frequently tried the cross himself, but his Kyloe cows were not good, and although their produce came to early maturity, he gave up the practice, finding Shorthorns more profitable.

At the time of the dispersion of his brother's herd, Robert Colling had the misfortune to lose his magnificent bull, George (475), who fell by accident and broke his neck, not, however, before he had got six heifers, five of whom were sold privately at 200 guineas each. He had two grand Wildair bulls to replace him: Phenomenon (491) by Favourite, and Wellington (680) by Comet. Phenomenon, whom Mr. Parrington considered a finer bull than Comet, was Wildair's brother; his son Wellington, "very good, ribs excellent," was used for four seasons. It was to Wellington that the Countess of Antrim sent the fourteen-year-old Princess from Wynyard, after she had bought her in at the sale of her late husband Sir Henry Vane Tempest's Shorthorns in October 1813. Her man was instructed to pay any price for the service Robert Colling chose to charge. Robert, however, told him that he never allowed any gentleman's cows to be bulled by Wellington, and could not comply with Lady Antrim's request. The man was already on his road home, when Colling's servant, like Gehazi, came running after him to say that he had told his master that Princess was not a gentleman's cow but a lady's, and that, amused with this distinction, Colling had replied, "I believe I promised Sir Henry that if ever he were in want of a bull, I would let Princess be served by one of mine. She may be put to Wellington at ten guineas."

This sum, promptly paid, was only on a par with those that Robert was receiving from bull-lettings. The two Wildair bulls were succeeded by Red Rose bulls: of these, Midas (435)—a great, fine bull and good, mellow handler, with super-excellent hind-quarters, but shoulders too upright and coarse—was let to Mr. Robertson of Ladykirk at 300 guineas for three years and to Mr. Arbuthnot at 300 guineas for two years. Barmpton, another Red Rose bull, calved in 1810—a small-sized, beautiful roan, with very broad back and fine quarters, but rather upright shoulders—was let to Mr. John Wright for one year at 60 guineas, and for the second at 70 guineas, and then went into service in Lincolnshire. A third bull of the same tribe, Lancaster (360), calved in 1814, was a white of fine quality, but narrow, thin, lanky and small, with indifferent rump. He was let in 1818 as a yearling to Major Rudd, who had "fourteen extraordinary two-year-old heifers got by him in one pasture, which

were the talk of the country." Lancaster is a fair type of the extent to which in-and-in breeding was carried at Barmpton [1] :—



Double bars = services. Single bars = produce. Cows' names underlined

In these circumstances the fear of deterioration must have been even more present at Barmpton than it had been at Ketton. One favourite four-year-old cow that had refused to breed was put to the plough in the spring and produced afterwards three living calves at a birth. Robert Colling was nearing seventy, and he resolved to sell off most of his cattle that were in condition on Michaelmas Day 1818. "The spirit south of the Humber was fairly roused at last, and the representatives of four or five more counties were found at the ringside." A bad start was made: two old cows, the first in the catalogue, were not offered; the seventeen-year-old Red Rose had been a magnificent cow, but was now very patchy,

[1] As numbers had not yet been adopted, the various Red Roses shown in the diagram were distinguished as "Red Rose by Hubback," "Red Rose by Foljambe," "Red Rose by Punch," &c. A still more intricate maze may be constructed by a diagram of the breeding of the heifer Restless, lot 44, by Lancaster, dam Clarissa by Wellington (680), gdam by Favourite, ggd. by Favourite, gggd. by Favourite, etc. A diagram of Clarissa's descent in the American Herd Book, vol. i., and Allen's *History of the Short-Horn Cattle*, erroneously gives six crosses by Favourite, through not attending to the errata in Coates' Herd Book, vol. i. p. 577.

with large cushions of fat on her rumps, and light fore-quarters; Moss Rose, her daughter by her own sire, was a handsome roan, even, wide, massive—by some thought rather small, but she would not breed. Lord Althorp purchased the Wildair cows Diana and Nonpareil, giving for the latter 370 guineas, the highest price of the day, the Red Rose cow Rosette at 300 guineas, and the bull Regent of the same tribe —"good, but horns up." Ruby, another Red Rose, went at 331 guineas into Mr. Robson's large herd in Lincolnshire. Nonpareil's daughter, Sweetbriar, was bought by Mr. Maynard, for 145 guineas, the most for any heifer. Hutchinson of Grassy Nook was mightily pleased with his cheap purchase of Jessy, a heifer of the old Blackwell blood, at 43 guineas; he found that she afterwards gave 24 quarts of milk in the day.

Mr. Wetherell, "the Nestor of Shorthorns," considered the Barmpton bulls the finest lot he ever saw at one sale. In spite of his twelve years, Marske (418), with good flesh but moderate hips, fetched 50 guineas. North Star (459), a year younger, "a grand old bull, with fine hair and handling, whose effective service proved him the real lode-star of Wetherell's fortunes at Holm House," was sold for 72 guineas. The celebrated Midas (435), a year younger again, the subject of a tough rally between Sir W. Cooke and Mr. Wiley, was knocked down to the latter at 270 guineas. Whitaker of Greenholme, who had bought the cow Golden Pippin for 142 guineas, was determined to carry off Lancaster (360) in spite of his colour, close breeding, and rumoured delicacy; he finally bid 622 guineas, but Robinson the auctioneer did not observe his nod, and Lancaster fell to Messrs. Simpson and Smith at 621 guineas. He thus went to Dishley, where by a useful service of nine years he showed at Bakewell's old home the advance Bakewell's pupils had effected with the once despised Shorthorns. The bull calves sold well: Diamond (206), though small, was of perfect symmetry, with a thick, fine coat; Harold (291), "good, but handle hard," consoled Whitaker for his loss of Lancaster, at 201 guineas; Mr. John Booth gave as much as 270 guineas for Pilot (496), a calf not wise enough to know whether his own sire was Major or Wellington. He was a small, compact animal "with bad crops," somewhat undersized, but possessed of great thriving capacity. There was no bull to which the Killerby, Studley, and Warlaby herds were more largely indebted.[1]

The total of, 7,852*l.* 19*s.* 0*d.* for sixty-one lots of Shorthorns

[1] William Carr, *The History of the Rise and Progress of the Killerby, Studley, and Warlaby Herds*, p. 21.

at Barmpton in 1818 was more than the total of, 7,379*l.* 8*s.* 0*d.* for the sixty lots of cattle at the Ketton sale. The average of the bulls, 215*l.* 17*s.* 7*d.*, was considerably higher than that at Ketton, which was only 169*l.* 8*s.* 0*d.*; and though the general Shorthorn average was 128*l.* 14*s.* 9*d.*, as against 151*l.* 8*s.* 1*d.*, there is every reason to believe that Barmpton was the better sale. "In 1810 things were at war price, and everything high, whilst in 1818 there was peace and a general depression upon agriculture." The sheep at Barmpton did well: 22 rams averaged 39*l.* 6*s.* 4*d.*, against the Ketton average of 12*l.* 12*s.* 6*d.* for 19. As a general sale of about the same number of cattle and sheep on a farm of about the same acreage, the grand total, notwithstanding the great dip in prices, was 9,496*l.* 4*s.* 0*d.* compared with the Ketton grand total of, 8,642*l.* 11*s.* 0*d.*

The subject of a Shorthorn Herd Book, which had been suggested as a means for assisting George Coates, a breeder in reduced circumstances, was brought up again by Colonel Trotter on the evening of the Barmpton sale. A subscription was started, and the list was largely signed by the breeders present. Nothing further, however, was done for the present.

The bull Midas (435), for which Mr. Wiley had paid 270 guineas, died suddenly at Brandsby, after having got only two calves. Wiley, greatly distressed, returned to Robert Colling and asked for the use of Barmpton (54), but Robert would not part with him, considering him one of the best bulls he ever had.

In 1819 Charles and Robert, in driving over to Major Rudd's "exhibition" at Marton, breakfasted with Mr. Hustler at Acklam. They looked through Mr. Hustler's cows, and were greatly taken with Acklam Red Rose, got by Yarborough from the American Cow. They mutually confessed to having never bred so good a cow, and considered that she had exactly Hubback's handling.

Robert Colling died unmarried at Barmpton on March 7, 1820. Those crossing the bridge over the Skerne, just under his house, had been so accustomed to see him shaving himself at the window that they believed they saw his ghost performing the same operation.[1] He left his property to Charles, and a final sale of the Barmpton herd was held on October 3. The highest price among the older cows was 102 guineas, paid for the white Lily, a daughter of the Lily sold for 66 guineas in 1818; Daisy, a daughter of the 33-guinea Daisy of 1818, made 101 guineas. A two-year-old heifer out of the celebrated Nonpareil

brought 151 guineas, just a little more than was paid for her sister at the former sale. Of the bulls, Barmpton (54) went to Eryholme at 115 guineas; Sir Charles Loraine gave the top price of 350 guineas for another Red Rose bull, Baronet (62). The whole forty-six lots produced 2,273*l.* 15*s.* 6*d.*, an average of 49*l.* 8*s.* 7*d.*; but many of them, it must be remembered, were animals with only a single cross of known Shorthorn blood.

There is something very pathetic in the long evening of Charles Colling's life, stretching for more than a quarter of a century after the Ketton sale. Sometimes he would think mournfully of his old triumphs, and say: "If I had only my eyesight and the use of my fingers, I should not despair of a new herd." A furious controversy broke out soon after Robert's death, on the question of the Galloway "alloy" introduced into the Ketton herd through Grandson of Bolingbroke. The Rev. Henry Berry declared that this was the real improvement that Charles had effected; others maintained that it bastardised the whole issue for all time. As has been already said the few who knew the real facts of Shorthorn history attributed the shortcomings they saw in the "alloys" not to the Galloway fraction, but to the bad Shorthorn strain into which it had first been introduced. They had their private misgivings as to the possibilities of unpleasant atavisms from the inordinate concentration of Lady Maynard blood, and set Hubback up as in their opinion one of the few survivors of the older Shorthorns. Hereupon their assailants, not knowing the really weak point in the armour of the purists, turned upon Hubback, and unsuccessfully endeavoured to make out that his dam was of Kyloe extraction. Charles Colling must have felt uncomfortable lest anyone should discover the Kyloe admixture in Eliza. The only part he ever took in the controversy was to make the private statement" that Hutchinson was egregiously wrong in charging the Collings with an indiscriminate use of Kyloe blood."[1] The qualification "indiscriminate" has a damaging sound, but there is no reason to believe that West Highland blood was introduced to any extent into their herds, otherwise

[1] Hutchinson's charge was levelled more at Robert than at Charles:—"I have been informed by a very credible neighbour of his that a Kyloe bull has been seen ranging his pasture, for a whole summer, amongst his short-horned cows . . . . . . Wellington and Barmpton were surely the neatest, the softest, and the shortest legged of his bulls (as was Moss Rose of his cows), and had more Highland hair—like all their descendants—than any I have seen of the Kettons (particularly the two-year-old heifers at the last Barmpton sale)."—*Origin and Pedigrees of the Sockburn Shorthorns*, pp. 44, 45. The "very credible neighbour" was possibly Robert Waistell, who seems to have possessed an unlimited imagination.

Thomas Bates, who was so frequently at Ketton and Barmpton, and was a great advocate for West Highland crosses at the time, must have known it, and have alluded to it in his private notes and correspondence.

The compilation of the Herd Book was taken up in real earnest at a meeting held in Darlington in February 1820. It was foreseen that unless the entries were read over to Charles Colling in the presence of two or three witnesses, and his remarks taken down, disputes would be endless. In spite of this warning Whitaker gave Coates a letter to Colling (for the two had not been on amicable terms), and he called at Monkend alone in the summer of 1823. The first time, he found Charles very unwell and quite unable to enter into the various pedigrees. A few days later he called again, and had some conversation with him; but this was all, and he received no warranty. Indeed, neither at Ketton nor at Barmpton do there seem to have been any regular records kept of the herds. In answer to inquiries Charles Colling wrote from Monkend, May 19, 1820 :—

> Mr. William Robson has looked over my brother's papers, and has not been able to find anything like a pedigree of his stock that goes further than the catalogue of his sale, which will be the only sure ground for Mr. Coates to go upon.

It was only an old acquaintance with some preliminary knowledge of his own who could draw satisfactory information on Shorthorn history from the recesses of Charles's memory.

By his original will of 1813 Charles Colling had left 2,000*l.* to his brother Robert, 20*l.* each to his cousins, the Misses Hall of Northallerton, 20*l.* to the poor of Brafferton, and the residue to his wife. This short and simple will he republished, "any act to the contrary notwithstanding," four times without any allusion to his brother being dead, and with the only change, an addition of a legacy of 50*l.* to John Trotter of Hallgarth, in 1823. After more than fifty years of happy married life Charles Colling died in his eighty-sixth year, on January 16, 1836. His widow survived till April 25, 1850, when she was upwards of eighty-seven.

The Collings were not the founders of a new breed of cattle, but they were the collectors and preservers of the best remaining specimens of an ancient breed that would otherwise have disappeared. That ancient breed had absorbed various infusions of blood, the marked characteristics of which became, in the course of time, associated with other breeds. It was only a wise and unsparing selection that could rescue the animals that bred back to their Shorthorn ancestors, through a prepotent atavism altogether out of proportion to the exact fraction of

blood, and only a resolute and unflinching system that could reconstitute the original breed with the materials so rescued. The idea of "quality," or handling, was the principle that directed the Collings in their selection, and "in-breeding," which they appear in their own case to have initiated rather than imitated, was the system they employed. It was not a popular system, and though the adoption of it was likely to injuriously affect the value of their cattle, they did not attempt to shroud it in mystery. It was a system attended with great physical dangers, but there is no reason to suppose that the use they made of it impaired the constitutional vigour of their herds.

They were, perhaps, not men of a high order of intellect; they left no journals nor correspondence on which to found their biographies, and occasional loose memoranda appear to have been all the notes they kept of their breeding operations. Robert was a model all-round farmer—good cattle, good sheep, good crops, neat hedges, neat farm-buildings. Charles was, it is said, more or less of a "sloven;" but the Barmpton herd, we are told, was never so good as the Ketton, being inferior in size, ribs, and "quality." Robert was contemptuously called "the sheep-man" by his sister-in-law's friends. It was the restriction of his work to Shorthorns, and the assistance he received in it from his excellent wife, that enabled Charles to take the lead of his elder brother as a specialist. It is the fashion now to talk of the Brothers Colling, but this makes it all the more necessary to insist on the important part taken by Charles Colling's wife in the evolution of the Improved Shorthorn.

Robert must have been an especially noble character, the very soul of honour: an intimate friend of both brothers, who was a fierce critic of all human frailties, only once found anything to complain of in Charles's conduct, and never anything in Robert's. The baronial hospitality of "the Prince of Skerne," as Robert was called, became proverbial. Notwithstanding Robert's mercantile training, Charles was more of the business man, more versatile both in opinion and practice. Both knew not only how to adapt an ancient breed of cattle to the requirements of their day, but also how to place it most advantageously before the public. "No breeders acted with so much foresight and sound policy," Hutchinson sarcastically observed, "for who but themselves would have thought of feeding any animal from calf-hood until seven years of age, in so extravagant a manner as the White Heifer was fed . . . . She was shown all over the kingdom like a wild beast; and raised the character of their breed, in the opinion of the world, to the highest pitch of

eminence."[1] In the well-known mezzotint of the worthy pair,[2] Robert, it has been remarked, is particularly good-looking, with features expressive of an honest, upright man; Charles is less handsome, his face has not an equal frankness.[3] They left no memoirs, they left no descendants—those on the spot have forgotten whether it was Robert or Charles that lived at Ketton; the water-trough and pillars of Weaver's picture have survived at Barmpton, but no one remembers having heard of the "White Heifer that Travelled." On the other hand, the race of cattle the Collings restored and remodelled keeps well to the fore; in Shorthorns generally they have found the monument their labours deserved, a monument that lasts and lives.

CADWALLADER J. BATES.

Langley Castle, Northumberland.

FLOWER AND FRUIT FARMING IN ENGLAND.[4]

III.

FRUIT GROWING IN THE OPEN.

PROGRESS IN PRODUCTION.

THE progress of fruit production in this country during the last twenty years is not to be measured merely by the official statistics, which show the expansion approximately. In the first place, since 1891 the Agricultural Returns have been collected only from holdings of more than one acre, whereas from 1869 to 1891 inclusive they were obtained from all holdings of a quarter of an acre or more. This change affected statistics of fruit much more than those of ordinary farm crops, as there are multitudes of holdings less than an acre in extent upon which fruit is grown. Again, there has been an immense amount of

---

1 *Origin and Pedigrees of the Sockburn Shorthorns*, p. 45.

2 By Thomas Weaver, probably painted in 1811 at the same time as the picture of the White Heifer. This was "Engraved on Steel by William Ward, A.R.A., Engraver to his Majesty and to H.R.H. the Duke of York," and "Published December 12, 1825, by John Thompson, Smeaton, Yorkshire," and subsequently republished by Thompson in September 1831. There is an engraving of Charles Colling by G. Cook, from a portrait by I. M. Wright, in the *Farmer's Magazine*, February 1844.

3 Allen, *History of the Short-Horn Cattle*, p. 94.

4 The two preceding sections of this report, dealing with Flower Farming, were published in the Journal last year (3rd series, vol. ix., 1898) at p. 286 (in Part II.) and p. 512 (in Part III.).—ED.

fruit planting in the gardens of persons living in the suburbs of towns who, probably, are not invited to make returns, even if their grounds exceed an acre in extent. In the third place, in consequence of the introduction of improved varieties of fruit and the better cultivation and treatment of plantations, the production per acre has become much greater than it was twenty years ago.

The area under orchards in Great Britain was first given in the Agricultural Returns in 1871, when it was far from being accurate, as mentioned in the returns of the following year. As one proof of inaccuracy, it may be remarked that 23,033 acres were returned as the area of orchards in Wales in 1871. This area was reduced to 10,680 acres in 1872, and still it was far too large, as it was brought down to 3,052 acres in the following year, though without a word of explanation. Probably the extent of orchards in Wales was still over-rated in 1873, as in 1878 it was returned at only 2,646 acres. The returns for England were less fluctuating; but they were altered from 176,685 acres in 1871 to 156,007 acres in 1872, and to 143,295 acres in 1873. However, taking 1873 as the first year in which the statistics were approximately accurate, the figures for that year are compared in the table on the next page with those of 1878, 1888, and 1898. With respect to the several counties of England the figures for Wales as a whole are also compared; and although my investigation does not extend to Scotland, it will be of some interest to notice the increase of orchards in that country and in the whole of Great Britain.

A steady expansion of orchards set in after 1873 in England, an increase having been returned every year except in 1888 and 1892, and the apparent decrease in 1888 was attributed in the returns for that year—the first in which statistics of small fruit were collected—to a small area, previously returned erroneously as orchard land, having been transferred to its proper place in the small fruit division. For Wales an expansion has been returned since 1875 in every year except 1888, 1892, and 1898; but the figures for Scotland have fluctuated, the total for that country being lower for 1894 than for 1873, though since 1894 it has increased by 292 acres.

According to these statistics, the increase of land devoted to orchards, even in England, has been less rapid during the last decade than in the preceding one, or than in the half decade ending with 1878. During the last twenty years the English area alone is represented as having increased by about 59,000 acres, or nearly 3,000 acres per annum. As there has been an expansion during that period in every county except

Extent of Orchards in Great Britain

England	1873	1878	1888	1898
County	acres	acres	acres	acres
Beds . . .	323	440	681	890
Berks . . .	1,095	1,523	2,270	2,633
Bucks . . .	1,544	1,666	2,373	3,249
Cambs . . .	990	1,515	2,315	2,825
Chester . .	1,820	1,495	1,941	2,361
Cornwall . .	4,057	4,649	5,100	4,990
Cumberland . .	239	265	319	386
Derby . . .	745	700	1,005	1,014
Devon . . .	24,448	24,744	26,485	27,136
Dorset . . .	3,339	3,636	4,265	4,431
Durham . .	126	149	283	299
Essex . . .	1,046	1,239	1,545	2,219
Gloucester . .	11,620	12,290	16,169	19,135
Hants . . .	1,110	1,247	1,750	1,986
Hereford . .	21,373	24,979	26,269	26,474
Herts . . .	1,102	1,110	1,298	1,544
Hunts . . .	356	296	532	717
Kent . . .	10,161	11,589	17,114	25,050
Lancaster . .	2,343	2,169	2,451	3,086
Leicester . .	565	598	972	1,188
Lincoln . .	1,152	1,428	1,872	2,117
London . .	—	—	—	172
Middlesex . .	2,622	3,004	3,750	4,919
Monmouth . .	2,420	3,086	3,888	4,009
Norfolk . .	1,304	1,618	2,158	2,899
Northampton .	560	566	772	1,051
Northumberland .	355	181	122	151
Notts . . .	1,364	1,580	1,916	2,220
Oxford . . .	830	932	1,692	2,022
Rutland . .	42	60	76	102
Salop . . .	2,593	3,078	3,900	4,788
Somerset . .	18,192	22,492	23,787	24,838
Stafford . .	860	815	1,251	1,203
Suffolk . . .	1,119	1,107	1,620	1,901
Surrey . . .	1,676	1,669	2,293	2,450
Sussex . . .	1,569	1,866	2,482	3,121
Warwick . .	849	984	1,736	2,364
Westmorland .	143	227	336	426
Wilts . . .	2,164	2,516	3,271	3,606
Worcester . .	12,706	14,696	18,658	20,418
York . . .	2,373	3,024	3,323	3,770
ENGLAND . .	143,295	161,228	194,040	220,220
WALES . . .	3,052	2,646	3,357	3,690
SCOTLAND . .	1,874	1,541	1,781	2,149
GREAT BRITAIN .	148,221	165,415	199,178	226,059

INCREASE OR DECREASE.

	1873–1878	1878–1888	1888–1898
	acres	acres	acres
England	+17,933	+32,812	+26,180
Wales	− 406	+ 711	+ 333
Scotland	− 333	+ 240	+ 368
Great Britain	+17,194	+33,763	+26,881

Northumberland, it may seem strange that the total increase is not greater; but it will be noticed that in most counties the advance has been very slight.

In relation to commercial fruit growing, the counties with the largest acreage of orchards are not necessarily the most important. With the exception of Kent, all which return over 5,000 acres are great cider counties, and all but a comparatively small proportion of their orchards are mainly devoted to cider apples, though the greater portions of the expansions which have taken place since 1873 may be regarded as additions to the acreage of fruit for market, especially those of Worcester and Gloucester. But by far the greatest increase in fruit plantations has taken place in Kent, where cider is not made to any considerable extent. Among the other counties in which orchards for commercial fruit growing have expanded considerably are Berks, Buckingham, Cambridge, Chester, Essex, Lincoln, Middlesex, Monmouth, Norfolk, Oxford, Shropshire, Surrey, Sussex, Warwick, Wilts, and York.

With respect to varieties of tree fruit grown in different parts of England, it is difficult to generalise, as most kinds are produced more or less in all the chief fruit districts. Still, in most divisions of the country there are predominating kinds of fruit. Kent and Middlesex are comprehensive, as great producers of apples, plums, and cherries, with more pears, perhaps, than are grown for market in some of the other fruit counties. The Western and South-Western counties are noted for apples, while pears are grown in those parts of England more commonly than in most others; but plums predominate in the Evesham and Pershore districts of Worcestershire, and are grown also extensively in Gloucestershire. Very little stone fruit is produced in Devon or Cornwall. Apples are largely predominant in the Midlands; but plums are most in evidence in Cambridgeshire and bordering counties, with cherries locally, and apples on a considerable scale; while Kent, Derbyshire, Lancashire, Cheshire, Shropshire, Worcestershire and Wales produce large or moderate quantities of damsons, which are also commonly grown in the country generally as wind-breaks on the outsides of fruit plantations.

Turning to the statistics of small fruit, the figures indicate the progress made in its production during one decade only, the first return having been made in 1888. In the following table the returns of that year and of 1898 are compared for the several counties of England, and for the whole of Wales, Scotland, and Great Britain.

Extent of Small Fruit in Great Britain.

England	1888	1898	England (*continued*)	1888	1898
County	acres	acres	County	acres	acres
Beds	89	209	Norfolk	883	2,810
Berks	126	347	Northampton	167	359
Bucks	206	604	Northumberland	326	543
Cambs	1,441	2,701	Notts	480	936
Chester	1,008	1,647	Oxford	49	230
Cornwall	716	1,511	Rutland	35	49
Cumberland	97	260	Salop	131	228
Derby	223	475	Somerset	288	486
Devon	803	1,324	Stafford	113	201
Dorset	63	137	Suffolk	333	637
Durham	199	320	Surrey	674	1,537
Essex	519	1,807	Sussex	483	1,096
Gloucester	1,042	1,414	Warwick	253	503
Hants	746	2,209	Westmorland	30	81
Hereford	175	597	Wilts	102	140
Herts	245	597	Worcester	1,360	3,129
Hunts	185	436	Yorkshire	1,729	3,072
Kent	12,344	22,031			
Lancaster	1,360	2,045	ENGLAND	32,776	63,438
Leicester	300	512	WALES	532	1,044
Lincoln	750	1,606	SCOTLAND	3,416	5,271
London	—	318			
Middlesex	2,649	4,172	GREAT BRITAIN	36,724	69,753
Monmouth	54	122			

INCREASE, 1888–1898.

	acres		acres
England	30,662	Scotland	1,855
Wales	512	Great Britain	33,029

It will be noticed that the totals for England and Wales have nearly doubled in the ten years that have elapsed since 1888; and probably, in reality, they have more than doubled, for corrections made in 1897 considerably reduced the small fruit area, while a slight further reduction was made in 1898, and it may be assumed that the errors in measurements then detected prevailed when the earliest return was made. In 1896 the totals were put at 69,610 acres for England, 1,275 for Wales, and 5,360 for Scotland, making 76,245 acres for Great Britain; while those for 1897 were 63,535 acres for England, 1,043 for Wales, 5,214 for Scotland, and 69,792 for Great Britain. Thus

the reductions were 6,075 acres for England, 232 for Wales, 146 for Scotland, and 6,453 for Great Britain. The figures for 1898, as given in the table, show an apparent contraction since 1897 of 97 acres in England, and gains of one acre in Wales and 57 acres in Scotland. The number of new plantations seen in all the districts I have visited has given me a confident opinion to the effect that there has been a considerable expansion of small fruit since 1896, instead of a contraction.

The great superiority of Kent in extent of small fruit land stands out in a striking manner. The area for 1898 is more than one-third of the total for England and Wales, and the increase since 1888 is much more than the combined totals of any two other counties. Middlesex comes next in total area under small fruit; but Norfolk shows the greatest increase, next to that of Kent, since 1888, followed by Worcester, Middlesex, Hants (mainly in consequence of the increase in the strawberry fields near Southampton), Yorkshire, and Cambridge. These are the only counties showing increases of over a thousand acres each. The limited areas of land under small fruit (a large proportion of which is grown between and under orchard trees) in some of the greatest orchard counties give some idea of the largeness of the proportions of their orchards devoted to cider apples, though the indication must not be regarded as anything like a precise one, as large quantities of apples for market, and cherries generally, are grown in grass orchards.

As to the varieties of small fruit grown in different counties, gooseberries are extensively produced in nearly all; currants to a much smaller extent, but still largely in most counties, and particularly in Kent; strawberries very extensively in Kent, the Southampton district, Middlesex, in the neighbourhood of Wisbech and onward through part of Norfolk towards King's Lynn, and on a considerable scale in parts of Essex, Gloucestershire, Worcestershire, Somersetshire, Lincolnshire, Yorkshire, and many other counties; raspberries mainly in Kent, and much less extensively in other great fruit counties; and nuts principally in Kent. In this connection it may be mentioned that in nearly all fruit districts black currants have lately fallen out of cultivation to some extent on account of the prevalence of that serious scourge, the black currant mite, for which, unfortunately, no remedy beyond the heroic one of cutting off the affected parts of bushes, and burning them, or uprooting and burning the entire bushes, has yet been found.

Open-Air Fruit Growing around London.

Although the districts around London are not nearly as important, proportionately to the rest of the country, in relation to the production of fruit in the open as in reference to flowers, the course of my journeys was the same for both classes of produce, and therefore it will be convenient to commence the description of my visits to fruit plantations with those made in the vicinity of the Metropolis. In the case of open-air fruit, however, it is not desirable to take as wide a scope as that of a twenty-mile radius from Charing Cross, as in the case of flowers, because this would extend metropolitan fruit plantations too far into Kent, which will be dealt with as a county by itself. Apart from Kent, these plantations are mainly within fifteen miles of Charing Cross.

As in the case of open-air flowers, the great fruit plantations near London are situated mainly in the Thames Valley, and for the most part on the western side of the river, from a little beyond Putney to Hampton, broadening out most towards the north-west from Twickenham, through Whitton, Hounslow, Heston, Sipson, Cranford, Southall, and on towards Uxbridge.

Most of the plantations in this old market-garden district are of considerable age, and in too many instances the trees are overgrown and too thick on the ground, not a few of them being old varieties which would not be planted at the present time. But in those that are best managed the very old or otherwise comparatively worthless trees have been removed to give place to young ones of good varieties, or have been polled and top-grafted with desirable sorts. In some of the old orchards nothing is done to prevent or remedy attacks of insects, neither grease-banding nor spraying being practised. The trees are too big to be sprayed effectually, except with very powerful machines, and, as one grower expressed it, "they are left to take their chance." Old-fashioned growers are to be met with who know very little about insects injurious to fruit, and have not even heard of the black currant mite, although they know there is something wrong with their bushes.

Where there is scope new plantations of top and bottom fruit, or trees with flowers as bottom crops, are to be seen. One of the best of these—and no better one was inspected by me anywhere—is that belonging to Mr. Walker, of Ham Common, near Richmond, the first in the Thames Valley to be visited. In addition to a considerable acreage of flowers and vegetables, Mr. Walker has 35 acres of fruit, about half apples, one-

fourth plums, and the remaining fourth pears. Gooseberries and currants are grown to some extent as bottom crops, but chiefly in the rows of trees, narcissi and peonies occupying most of the spaces between the rows. No damsons, raspberries, or strawberries are grown. The soil is sandy; but, with the liberal treatment practised by the occupier, most varieties of fruit flourish in it admirably. The great majority of the trees were planted from eleven to twelve years ago, when they were three years old from the budding, and they have made such fine growth that thinning has already become necessary. Mr. Walker has obviously brought a great deal of thought and good judgment to bear upon the selection, planting, and treatment of fruit trees, and he was willing to impart information as to the results of his experience without reserve. Therefore it appears desirable to dwell more fully upon the results of the visit to his plantation than upon those of other inspections of metropolitan orchards.

The principal varieties of cooking apples, early sorts being placed first, are Lord Grosvenor, Grenadier, New Hawthornden, Stirling Castle, Bismarck, Duchess of Oldenburg (also valuable as a dessert apple), Lane's Prince Albert, and Wellington. One of the most popular apples among market growers in some districts, and especially upon heavy soils, Bramley's Seedling, does not flourish well in the sandy soil of Ham Common; while Peasgood's Nonesuch, one of the finest and the most handsome of all cooking apples, is not to be compared as a cropper, in Mr. Walker's opinion, with such varieties as Lord Grosvenor, Lane's Prince Albert, and Bismarck. Duchess of Oldenburg and Stirling Castle are also great croppers at Ham Common. The principal dessert apples, in addition to the Duchess of Oldenburg, are Quarrenden, Peter the Great (otherwise Cardinal), Worcester Pearmain, Benoni, King of the Pippins, Cox's Orange Pippin, and Yellow Ingestrie.

The chief pears are Clapp's Favourite, Williams's Bon Chrétien, Fertility, Louise Bonne of Jersey, Marie Louise d'Uccle, and Emile d'Heyst. Fertility is the variety most extensively produced, as it is a great cropper, and it comes in just after the common Hessel, which is the variety grown on the largest scale in nearly all metropolitan market orchards. Fertility is superior to Hessel, and makes a better price. Very few late pears are grown, as Mr. Walker does not store fruit, but sends all to market as soon as it is picked.

The plums most extensively grown are Rivers's Early Prolific, Czar, Victoria, Pond's Seedling, and Monarch. The variety named first, a wonderful cropper in most parts of the

country, does not yield as well as some other kinds at Ham Common, and this is also the case with Prince of Wales.

No lesson in fruit growing is more important to a beginner than that which will impress upon him the necessity of ascertaining the varieties that flourish in his particular district. Some varieties appear to do well or fairly in all parts of the country; while many, though wonderful croppers in some districts (in relation to climate) or on certain classes of soil, are unsatisfactory in others.

Mr. Walker had a tremendous crop of apples last year, but only a passable one of plums, and (like all other large growers) a poor one of pears. The sight of farmyard manure literally heaped up around the apple trees called forth the explanation that where fruit is found to have set well, Mr. Walker, to use his own expression, rushes on the manure. This, again, is a very important hint.

One advantage of an exposed situation, Mr. Walker believes, is comparative immunity from aphides, which are most common where there is shelter. He suffers so little from these pests that he does not spray his trees. As to attacks of caterpillars, he relies on grease-banding. In about the middle of October greased paper bands are placed around the trunks of all apple trees to catch the females of the Winter Moth and other species. In a week or ten days the coating of grease is renewed on the same band. The grease used is Horne's patent fruit-tree dressing. A great many moths are caught in this way. As for the caterpillars of species of moths the females of which can fly, the trees are left to take their chance, but do not suffer greatly in this plantation. It is worth while to notice that several varieties of moths are caught, but hardly any caterpillars; also that the great majority of the moths caught are winged insects. Mr. Walker explains that he bands apple trees only, because, he says, caterpillars develop on the leaf, and plums and pears have longer fruit stems than apples, so that the caterpillars cannot reach the fruit. He notices that the apples most attacked are those of the Codlin family, the young leaves and fruit of which frequently touch each other. Mr. Walker is afraid of possible danger from arsenical spraying, especially where there are gooseberries under the fruit trees.

Nearly all the apples are on the paradise[1] stock and of bush form, a comparatively small number being on the crab. Mr.

[1] This stock is raised from the French apple-tree named *Paradis*, a variety of dwarf habit, rooting close to the surface of the soil. The strain of English broad-leaved paradise stock is now preferred to strains raised in France, as it is longer-lived and more vigorous.

Walker favours the plan of planting apples on the paradise and the crab alternately, so that the latter, which are the longer-lived, may stand alone when they fairly cover the ground. But even better, from one point of view, is the plan of growing plums alternately with apples or pears, as the different classes of fruit take different constituents from the soil. In part of the orchard there is a very fine plantation of pears on the pear stock and plums growing alternately, the rows being 21 ft. apart, and the trees 10 ft. apart in the rows. By the time that the plums become old and begin to die off, the pears will sufficiently cover the ground. In this plantation there is an object-lesson to growers warning them not to plant fruit trees where oaks have stood, both pears and plums on a small patch, after oaks, being dwarfed and sickly. Near by is a plantation of bush pears on the quince stock, 13 ft. by 10 ft. apart.

In one great lot of apples in the bush form on paradise stock, planted eleven years previous to last autumn, 10 ft. by 9 ft. apart, it has become necessary to take out every other tree—a lamentable but necessary sacrifice of trees now in full profit. Similarly, in the case of a well-grown and perfectly healthy lot of four hundred Cox's Orange Pippins (there are two hundred in another place), planted six years previous to last autumn, when three years from the budding, 13 ft. by 10 ft. apart, every other tree is now being reduced in size by trimming, and in a few years will have to be dug up. Again, a magnificent lot of four hundred Duchess of Oldenburg apples on the paradise stock, planted five years ago, when three years from the budding, 13 ft. by 10 ft. apart, are already too thick, and would have been better planted 13 ft. by 13 ft.

With respect to the relative advantages of dwarf and standard trees, Mr. Walker prefers apples on the paradise stock and pears on the quince; but these require to be liberally treated to give good results, and for farmers he would recommend apples on the crab, 24 ft. apart each way, with a plum tree between each pair of apples in the rows, and bush fruit as a bottom crop.

For his own instruction, Mr. Walker has a large trial plot, upon which he grows over a hundred varieties of apples, to test their value and their suitability to his land.

As to the distances of plums, a lot of four hundred of the Czar variety, 16 ft. by 10 ft. apart, and now about ten years old from the time of planting, are quite thick enough. It is a question of somewhat difficult calculation to decide whether fruit trees should be planted closely or comparatively widely. In

the former case there will be some years of extra production before half the trees have to be thrown away. But where bottom fruit is grown, the balance of advantage appears to lie in planting standard apples on the crab or pears on the pear stock, 24 ft. to 30 ft. apart, with dwarf apples or pears or plums at half distances, so that no uprooting will be necessary for about twenty years, after which the standards will cover the ground. Or if dwarf trees are grown, with bushes and strawberries or flowers between them for a time, experience at Ham Common indicates that 12 ft. to 15 ft. apart, according to variety, will not be too great a width for a permanency. These remarks apply to fruit growing on a considerable scale. In small gardens, trees to be trimmed and root-pruned may be grown much more thickly. With respect to pruning, Mr. Walker thins his trees sufficiently to let sunshine and air to all parts of them, but otherwise is sparing in the use of the knife. The important hot-house division of the Ham Green enterprise is left for notice hereafter.

As a good example of the old fruit plantations of the Thames Valley, that held by Mr. Poupart, of Twickenham, was visited. The nursery is about 160 acres in extent, between 50 and 60 acres being devoted to fruit, and the rest to vegetables and flowers. Plums are most extensively grown, but also considerable quantities of apples, and some early pears. Gooseberries are grown as bottom fruit in the orchards, but no currants. Rhubarb is largely cultivated, and a good deal is forced early in the year, the roots being simply laid in soil in dark and heated sheds, cheaply constructed of wood. Mr. Poupart cultivates a new variety of rhubarb, Dawes's Champion, of which he has a high opinion. Some of the apple and pear trees are said to be a hundred years old; but a good many young trees have been planted to supersede old and inferior trees, and the orchards are well cultivated, and otherwise well managed. Only early pears are grown, as Mr. Poupart is of opinion that late varieties do not pay now that consumers insist upon having the large and showy, but comparatively flavourless, Californian pears, which are imported in considerable quantities. Formerly, he said, English growers used to keep late pears extensively in sheds to ripen; but now the practice is not remunerative. The rows of fruit trees (mixed plums, apples, and pears) are 16 ft. to 18 ft. apart, and the trees in the rows about 12 ft. from each other. A few cherries and a fair quantity of outdoor wall-fruit are grown, but no strawberries. Mr. Poupart sells his own produce in Covent Garden, and thus is able to make the most of it. But he does not agree with growers who think that the sales-

men's usual charge of 10 per cent. on the returns is too high. On the contrary, he believes that it hardly pays, allowing for market charges and the cost of providing packages. Old orchards in the Twickenham district let at 8*l.* to 8*l.* 10*s.* an acre, and land sells up to 1,000*l.* an acre, or even more in some places. The soil throughout the district is mainly a good and deep loam over gravel.

On a neighbouring plantation the fruit crops were found similar to those just noticed, with the addition of between 30 and 40 acres of strawberries; and in another market garden at Isleworth there are over 100 acres of mixed fruit trees and bushes. In this parish some raspberries, as well as currants, were found growing under fruit trees.

Many other orchards were viewed in passing through Teddington, Hampton, Feltham, and on the road from Feltham to Hounslow, as well as towards Bedfont, where there is one very extensive grower of fruit.

At Whitton, near Hounslow, plantations of apples, plums, and pears were noticed, while cherries are largely grown at Heston. The top rent of planted orchards at Whitton, according to a good authority, is 8*l.*, while the rent of a farm adjoining a nursery has been reduced from 3*l.* to 2*l.*

Southam, an important strawberry district, was passed through on the way to Cranford, where also, and in neighbouring parishes, strawberries, raspberries, and some cherries are grown. Mr. Neighbour, of Cranford, for example, has seven acres of strawberries, chiefly Paxtons, with a few Royal Sovereigns and British Queens. There are many much more extensive growers in the neighbourhood, but no better growers, the fruit seen on the occasion of my visit being magnificent. Mr. Neighbour, who has 45 acres of land devoted to fruit and flowers, grows also plums, damsons, apples, gooseberries, and currants.

Mr. Evans is another Cranford fruit grower who was visited, and, like Mr. Neighbour, he has already been noticed as a grower of flowers. He grows apples and pears chiefly as top fruit, with some plums (mostly Prince of Wales) and Bigarreau cherries; but, in growing fewer plums than apples or pears, Mr. Evans is exceptional in his district. For bottom fruit he produces raspberries, black and red currants, and gooseberries. In consequence of attacks of the mite, the black currant crop has failed for three years. It was surprising to learn that fruit plantations in Cranford, twelve miles from Covent Garden, let in some cases for rents as high as 10*l.* to 12*l.* an acre, or from 25 to 50 per cent. more than the usual

rents of orchards in parishes very much more populous and nearer to London.

A very interesting visit was made to Mr. Fanning, of Heston, the next parish to Cranford. He has 40 acres of fruit, mainly in the former parish, but partly in the latter; also a number of hot-houses. Apples, pears, plums, gooseberries, red currants, raspberries, and strawberries are grown. Apple trees are one rod apart each way, some plums being half a rod, and some wider apart, while there are two rows of bushes between the rows of trees, and other bushes in each tree row. As an indication of the varieties of the different classes of fruit most commonly grown in the district, I asked Mr. Fanning to give me the names of the leading sorts in his plantations. In response he said that the principal apples were Golden Noble, Jubilee, Yellow Ingestrie, Worcester Pearmain, Cox's Orange Pippin, Rosemary Russet, Julian, Manx Codlin, Keswick Codlin, Wellington, Lord Suffield, and Nonesuch. The plums are Victoria, Gisborne, Prince of Wales, Rivers's Prolific, Magnum Bonum, and Pershore. As in most other metropolitan market gardens, the pear principally grown is the early Hessel (or Hazel). The raspberry grown is the Semper Fidelis, not large enough for dessert, but good for jam. Incidentally I learned that raspberries sold at 38*l.* per ton in some cases last season for the jam factories. Mr. Fanning grows a few cherries, which others produce extensively in his district. The orchards and vegetable fields suffered extremely from drought last season, and the old apple and pear trees looked as if they had been scorched. In one apple orchard from which 400 bushels of fruit are usually obtained, and one season 700 bushels were grown, only 40 bushels were gathered in 1898. Apples and pears were not more than half their usual size. Moreover, Mr. Fanning said that the trees would take two or three years to recover their vigour for fruiting. The subsoil of gravel lies from 6 in. to 18 in. below the surface. One of the most interesting crops was half an acre of Early Evesham tomatoes in the open, which produced an abundant crop of well-ripened fruit, worth 3½*d.* to 4*d.* per pound wholesale. Some Chemin Rouge tomatoes were grown in pots under glass till the fruit was set, and then put out of doors; but Mr. Fanning prefers the more hardy Early Evesham for an outdoor crop. Peaches and nectarines are grown under glass. Cherries had been picked when my visit to Heston was made; but I learned that the crop was small last season.

Mr. Thomas Wild, of Sipson (a hamlet of Harmondsworth), occupies about 300 acres of land, half of which is in fruit, con-

sisting of apples, plums, damsons, pears, gooseberries, red currants, raspberries, strawberries, and some cherries. Here, as in many other places, no black currants are grown because of the mite. In this plantation, as in the one last noticed, apples and pears suffered greatly from drought, and were much less than their proper size; but plums and damsons turned out well. The soil, of sandy loam, is of great depth in some places, and in others 1 ft. to 3 ft. above the gravelly subsoil. Mr. Wild is one of the most extensive growers of forced seakale in the country. My time in his premises was spent chiefly in the hot-houses, which will be noticed in another division of my report. The rent of fruit plantations in the Sipson district appears to be from 7*l.* upwards, and probably the much higher rents mentioned as paid in Cranford are exceptional.

By the kindness of Mr. George Taylor, of Cranford, I was driven through miles of fruit plantations in Cranford, Heston, Harlington, Harmondsworth, and Sipson. Most of them were orchards of fully matured trees and bushes, but some excellent new plantations were seen in the course of the drives.

To the north of London a few excellent young plantations of top and bottom fruit were seen, including one of about 40 acres close to Enfield Highway. At Cheshunt one grower has 300 acres, including a considerable extent of strawberries and raspberries.

On the whole, the prevailing impression derived from my inspection of metropolitan orchards is that the trees are too thick on the ground as a rule; but there are numerous exceptions among the younger plantations.

Fruit Plantations in Kent.

As representing the main divisions of fruit production in the "Garden of England," the districts in and around Orpington, St. Mary Cray, Swanley, and Greenhithe, were chosen for strawberries and raspberries; the neighbourhoods of Maidstone, Swanley, and Faversham for top and bottom fruit generally; and the Faversham district especially for cherries. There are no strict lines of division, as nearly all kinds of fruit are grown more or less in the districts named and in a few others visited; but the preponderating classes of the fruit industry are indicated in the explanation of the selection made.

Messrs. William and Edwin Vinson together have about 1,000 acres of strawberries and raspberries in the Orpington and St. Mary Cray districts; and when in partnership, until the end of 1897, they were the most extensive growers

of these fruits in England, if not in the world. They had 650 acres of strawberries and 350 acres of raspberries, with a few acres of other kinds of fruit. Now Mr. William Vinson, to whom my visit was made, has about 300 acres of strawberries, and his brother 350 acres. He is of opinion that the fruit industry is overdone. Fruit prices, he said, had fallen about 20 per cent. in the last twenty-five years, but are about the same as they were twenty years ago, or perhaps a little higher. Still he does not regard 16*l.* a ton, paid by jam makers for strawberries in 1897, or 18*l.* in 1898, as fairly remunerative; and he mentioned 30*l.* a ton as unsatisfactory for raspberries, though, as the fruit was scarce during the past season, such a price was considerably below the usual level. In reply to a question as to the competition from the Southampton strawberry growers, Mr. Vinson said that, as they were much earlier than Kent growers with their produce, they had the best of the market. On June 28, when my visit was made, the Southampton strawberry season was nearly half over, while the Kent season had only just begun, both being later than usual. Although the cold weather of May and June was against the strawberry crop, a fair quantity of fruit was found in the fields which we walked over, Mr. Vinson being an excellent grower. Sir Joseph Paxton is the principal variety grown on his farm and on many others in the district. It is a mid-season variety, and is preceded by Noble, the earliest in common use, and the comparatively new Royal Sovereign, lately come greatly into favour. Stirling Castle is another variety grown in the district. About ten years ago Mr. Vinson obtained from a field of the strawberry last named 2½ tons per acre at one picking, a quantity he has never known to have been obtained before or since by any grower. Subsequent pickings brought the total yield up to nearly or quite 6 tons per acre, a wonderful crop. Strawberries usually stand for four or five years, according to variety and soil. They do not flourish as long as they did formerly, because the varieties grown for years past have degenerated. Paxton, for example, still regarded as the best market strawberry, although Royal Sovereign is running it hard, is more liable to mildew than it used to be, and it is a pity that a completely new strain of this delicious and, in all respects excellent, variety has not been raised. Raspberries have suffered greatly from recent dry summers, not having made enough cane, and the crop of the past season was a poor one.

Wages paid by fruit growers in Orpington and neighbouring parishes are 18*s.* to 20*s.* a week. Strawberry picking is done

by the 'piece' usually, and prices vary with seasons. The driver of a vehicle which conveyed me from St. Mary Cray to Swanley informed me that his sister had earned up to 35*s.* a week at a first picking, and down to 20*s.* or less at second and third pickings.

At Crockenhill, near Swanley, Mr. John Wood, a very large and successful grower, has 600 acres of fruit, including 150 acres of strawberries and 140 acres of raspberries, the rest of the land being devoted to apples, pears, plums, damsons, gooseberries, currants, and a few cherries. The Paxton is the principal variety of strawberry; but Mr. Wood, like Mr. Vinson, complains of it as "wearing out," as shown by its mildewing badly. Royal Sovereign is being more and more extensively grown on this farm, though Mr. Wood considers it inferior to Paxton in flavour, and it does not travel so well—no other variety does. Mr. Wood will not have anything to do with the watery and flavourless Noble, early though it is, as he declares that it "cripples the strawberry trade," meaning that it is a source of much dissatisfaction among wholesale and retail buyers. The yield of strawberries varies from one ton to five tons per acre, the latter being an extra great crop; while one ton to one ton and a half may be considered a fair crop of raspberries. For strawberries the proprietors of jam factories were offering about 16*l.* a ton, and for raspberries 30*l.*, Mr. Wood said, but another grower gave 16*l.* to 18*l.* as the price of the former, and 35*l.* as that of the latter. Large quantities of these fruits, however, and especially of strawberries, are sold by the peck or in punnets as dessert fruit at much higher rates. On the Saturday before my visit, for example, early pickings of Kent strawberries made 9*s.* a peck. The crop of raspberries was a light one last season at Crockenhill, as in nearly all other districts.

Mr. Wood grows more apples and pears than plums. The first two yielded badly in 1898, and the last well. Rivers's Early Prolific, Czar, Victoria, and Monarch are the principal plums grown at Crockenhill. The late Monarch plums, Mr. Wood thinks, will supersede damsons to a great extent, and he is grubbing up his damson trees, except where they grow in the fences. Early varieties of apples and such early and common pears as Hessel and Fertility are chiefly grown.

About 140 acres of gooseberries are grown as bottom fruit in plantations of trees. A few years ago gooseberries came down in price to 2*s.* a bushel in seasons of plenty, and many acres of bushes were grubbed up. Now they make 4*s.* to 6*s.* a bushel, or even more occasionally. The black currant mite is

so destructive at Crockenhill, Mr. Wood said, that he would have to grub up his bushes. The mite does not attack the old common black currant much; but that variety is a poor cropper. The superior Baldwin is much infested. Farm land in the district suitable for fruit makes 100*l.* to 150*l.* an acre. Mr. Wood has a considerable expanse of hot-houses, which will be referred to hereafter.

Messrs. Wood Brothers, successors to the late Mr. Thomas Wood, hold about 3,000 acres of land in Kent, about 2,000 acres being under fruit. They have plantations in Swanley, Sevenoaks, Lee, Farningham, and East Farleigh, also a jam factory at Swanley, and another, chiefly devoted to confectionery, in London. They grow strawberries very extensively, as well as all the usual kinds of tree and bush fruit. Near Farningham 550 acres in one place, without any dividing fences, I believe, were pointed out to me, nearly all being under fruit. The extent of their cultivation of raspberries may be grasped from the statement that last year, a bad season, they expected to produce 500 tons of this fruit. As the crop could hardly be much over a ton per acre in 1898, the number of tons may be taken as approximately the number of acres. The crop of plums was estimated at 150 tons. In one parish Messrs. Wood have planted 45,000 black currants this year. In driving me through some of Messrs. Wood's plantations, Mr. Cannell stated that he had known 75 tons of strawberries to be despatched from Swanley Station in one day, in addition to large quantities sent by road.

In the jam factory there are fifteen steam-jacketed vats in one row, and six others for candied peel. Mr. Leopold Wood, who manages the factory, stated that he expected to produce last season about 3,500 tons of jam, 850 tons of candied peel, and 750 gross (108,000 bottles) of bottled fruit. The space available to me is not sufficient to allow of full descriptions of jam factories; but a few points of special interest must be noticed. Of course, a great deal of the fruit preserved is bought, while much grown on the farms is sold. Great quantities of gooseberry jelly and orange, lemon, and citron peel were being prepared on the occasion of my visit. Some Dutch black currants, earlier than English, were being put through a patent strigging machine, invented by the late Mr. Thomas Wood. One machine, it was said, saved the work of fifty women in taking the currants off the stalks. A large chamber was full of casks of black currant pulp, which were to be rolled outside to be kept till winter, when there would be time to make their contents into jam. Strawberries, it was explained, cannot be

pulped to advantage, though raspberries can be, and are, pulped. There were 10,000 two-gallon bottles in the factory ready for raspberry pulp. Apricots for jam are received chiefly from France and Spain, as they cannot be profitably grown in this country. Oranges, lemons, and citrons for candied peel are imported, cut in halves, in casks of brine. The fruits are first boiled, and next the insides have to be cut out and wasted. Then the peels are laid in fresh water for three days, after which the syrup is applied to candy them.

The Horticultural College at Swanley has 42 acres of land attached to it, nearly all devoted to fruit. The land is entirely cultivated by the male and female students (twenty of the former and thirty-five of the latter last session) and the foremen who direct their labour. There is no distinction in the kinds of work done by the males and the females. The former work from 7 A.M. to 5 P.M., and the latter from 9 A.M. to 5 P.M., with intervals for meals and for lectures (about two hours for each). After 5 P.M. the lads are required to study for an hour. The girls need no compulsion. There are three skilled instructors in the hot-houses, one in the flower garden, one in the kitchen garden, and one in each fruit plantation, all of which divisions appear to be well managed. Interesting experiments in the growing of fruit, vegetables, and flowers are carried on, and fruit is made into jam, bottled, and dried in the College. There is a range of fifteen hot-houses 100 ft. long, with a few propagating houses in addition. In the open, apples, pears, plums, gooseberries, currants, nuts, strawberries, and raspberries are grown; and in the hot-houses, grapes, tomatoes, peaches, nectarines, melons, and cucumbers. The College, which gets no subsidy from any public authority, because it is a proprietary institution, affords excellent opportunities of theoretical and practical training. Mr. F. Graham Powell is the Principal.

Much that was interesting was noticed in a drive of some miles through almost continuous fruit farms in the Swanley district; but other parts of Kent now claim attention.

In the Maidstone district Mr. Frederic Smith, of Loddington, was named by some good authorities as one of the best fruit-growers in Kent, and a visit to his plantation of 200 acres fully confirmed this statement. The soil is a loam over Kentish rag, or clay in places. There was no fruit, outside an ordinary farm orchard, on Mr. Smith's farm when he came to it in 1881, and in other parts of his district there has since been a considerable increase. He grows chiefly apples, plums, and damsons as top fruit, with a few common pears and a small lot

of cherries. The land lies too high for pears, Mr. Smith thinks, and at any rate they do not flourish on his farm. His apples and plums, mostly half standard, which were first planted when or soon after he took possession of the farm, are now in full profit, and no one could wish for a more prosperous-looking lot of trees. Cob nuts are the principal bottom fruit, half the land, or 100 acres, being occupied with them and the trees under and among which they grow; while gooseberries and red and black currants are grown on most of the rest of the land as bottom fruit. Damsons, chiefly of the Crittenden variety, are grown, for the most part, as a fencing around the orchards. A few raspberries are cultivated on an off-hand farm.

No one could have been more willing than Mr. Smith was to impart information, and as it is clear that he is one of the most successful of fruit-growers, the notes taken down as to his methods of planting, culture, and treatment, with those on some results of his experience, appear to me well worth giving. In planting trees Mr. Smith trenches the land 2 ft. deep in squares 6 ft. across. It would cost 8*l.* an acre to trench all the land, and this is seldom done. He raises most of his own fruit trees, and therefore could not give an estimate of the cost of a plantation, as it depends largely upon the cost of the trees and bushes. Summer pruning is pursued with apples and plums for the first few years after planting; later on they do not need pruning in summer. He has given up grease-banding his trees, because he found that it was not sufficient as a protection against most of the moths which are sources of injury. As he had to wash the trees also, he decided to trust to spraying alone, and save the expense of grease-banding. Trees had been sprayed three times by the end of June where they needed so many washings; gooseberries three times for red spider, and black currants once for aphis. A strong solution of quassia and soft soap is used for aphis on trees or bushes, a paraffin and soft soap emulsion for American blight, Paris green for caterpillars, and liver of sulphur wash for red spider among gooseberries.

But it is important to observe that Mr. Smith considers it unsafe to use Paris green for trees where gooseberries are underneath them, as the berries are getting big when the fruit on the trees is just set, and washing is needed. The poison, he thinks, might remain on the berries. In such cases, therefore, he adds liver of sulphur, at the rate of 3 lb. to 100 gallons, to his quassia and soft soap wash. This will kill caterpillars when they are quite young; but, as they do not all hatch at

once, several sprayings are necessary when this wash is used.[1] Paris green is best for caterpillars where it can be safely employed.

The trunks of fruit trees are washed early in the spring with a solution of caustic soda and potash, which is better than lime, but more expensive.

Apple-suckers, the larvæ of *Psylla mali*, resembling aphides, are the most mischievous pests at Loddington. They often do an immense amount of damage before they are noticed by growers not acquainted with them. For a description of this insect, readers are referred to Miss Ormerod's recently published volume on "Orchard and Bush Fruit Insects."

Mr. Smith does not crowd his orchards. He recommends the following distances for apples where bottom fruit is grown:—Standards or half-standards, 24 ft. by 24 ft. for strong-growing varieties, and 24 ft. by 18 ft. for weak growers; bush apples, 12 ft. by 12 ft. Where standards (or half-standards) are somewhat closely pruned, he plants 24 ft. apart in rows 12 ft. from each other, putting each tree in one row opposite to the middle of the space between two trees in the next row. Planted thus, the trees in the rows are 24 ft. apart, while each one is 17 ft. in a diagonal direction from a tree in the next row. This plan of planting is pursued by many fruit growers.

For standard pears the distances recommended are 30 ft. by 30 ft., and for pyramid pears 15 ft. by 15 ft.; for strong-growing plums, 24 ft. by 24 ft., and for weak-growing varieties 18 ft. by 18 ft.; for cherries, 30 ft. by 30 ft. Gooseberries are planted 6 ft. by 6 ft. apart, or 5 ft. by 5 ft., according to variety; but

[1] Miss Ormerod, who has been consulted as to the best wash for caterpillars where it is not safe to use Paris green, recommends paraffin emulsion; or, as this is difficult to make properly, "Antipest," containing almost the same ingredients, and manufactured by Messrs. Morris, Little, & Son, of Doncaster. A genuine paraffin emulsion, however, in which the paraffin will not separate from the water, can be made by the recipe of the Maryland Experiment Station, as follows:—Ingredients, ½ lb. of soft soap, 1 gallon of water (rain water if convenient), and 2 gallons of paraffin. Put the water in a vessel holding 4 or 5 gallons, add the soap, place on a stove, and bring to the boiling point, occasionally stirring it to thoroughly dissolve the soap; then remove to the yard, or some convenient place away from the fire, and pour the paraffin directly into the water. This should then be pumped in and out of the vessel with a good force pump for from five to ten minutes, or until the emulsion is formed. If properly made, it will have the appearance of buttermilk, and will readily mix with water without any oil coming to the surface. It will keep an indefinite length of time, becoming a semi-solid when cold. If used when fresh it can be diluted with cold water to the strength desired; but if cold and hard, warm water should be used. Every gallon of the emulsion used should be diluted with from 10 to 12 gallons of water, and applied with a good spray pump.

the bushes in the latter case require close pruning. Currants are mostly grown 6 ft. by 5 ft. apart, pruned closely.

Mr. Smith, it may be pointed out here, raises his gooseberry bushes without shanks, branching out from the roots. When so grown, he contends, the loss of a branch is more easily made good than where it grows from a shank. On the other hand, the branches are more liable to rest on the ground, so that the fruit is likely to become dirty.

The apples are all on the crab stock, as trees on the paradise do not flourish in the soil of Loddington. But, except in one old orchard, the trees are half-standards, branching out 3 ft. or 4 ft. from the bases, which is as low as can be allowed if the branches are to be kept out of the reach of rabbits and hares. The varieties most extensively grown are Early Julian, Gladstone, Yellow Ingestrie, Lucombe's Seedling, Worcester Pearmain, Lord Suffield, Bismarck, Stirling Castle, and Bramley's Seedling, while Newton Wonder is being extensively planted. Cox's Orange Pippin flourishes best in a clay soil, Mr. Smith says, and he does not grow it extensively. He grows many varieties other than those mentioned, and he has obliged me with a list of the chief sorts grown for market in his district of Kent. The principal cooking varieties are Early Julian, Lord Suffield, Stirling Castle, Domino, Golden Noble, Lord Derby, Waltham Abbey Seedling, Eclinville Seedling, Loddington Seedling, Tower of Glamis, Lane's Prince Albert, Warner's King, Queen, Bismarck, Queen Caroline, Alfreston, Wellington and Newton Wonder. The dessert sorts most commonly grown in the district are Gladstone, Yellow Ingestrie, Cox's Orange Pippin, King Pippin, Devonshire Quarrenden, and Worcester Pearmain.

The pears grown by Mr. Smith are mostly Hessels and Winter Windsors. The plums include the Czar, Early Rivers, Victoria, Black Diamond, Pond's Seedling, Denniston's Superb Greengage (sometimes called the Cambridge), and Monarch. The real greengage of the old type does not bear well enough to pay; Czar and Victoria are great croppers at Loddington, and Early Rivers not quite as good; Black Diamond is not usually a heavy bearer, but gave a great crop last year. Mr. Smith once had twenty bushels off a large tree of this variety, and on another occasion he gathered twelve bushels off a young Victoria plum tree, selling the fruit at 14*s.* a bushel. In 1897 Victoria plums sold at 16*s.* to 20*s.* a bushel, the crop being a light one in the country generally.

Lancashire Lad is the principal gooseberry at Loddington, though Whinham's Industry is also extensively cultivated.

With respect to black currants, Mr. Smith is troubled with the mite to some extent, but not sufficiently to prevent a fair crop being produced last year. Red currants also yielded fairly. Black currants of the old variety, Mr. Smith said, were not much affected by the mite, unless they were growing side by side with Baldwin, or some other modern sort badly infested.

Some apples, such as Bismarck, Mr. Smith says, pay six years after planting, while Blenheim Orange is not profitable much before twenty years. A plantation of Bramley's Seedling was found badly mildewed, having been injured by frost. Probably cold winds did as much damage as frost to apples in the blossoming season this year; for while some early sorts, such as Golden Spire and Quarrenden, were badly injured, some late kinds, including Loddington Seedling, suffered equally.

An old apple orchard was noticed in which the trees had been topped and grafted with superior varieties of fruit. When so treated old trees, if healthy, often do well. From some trees of Lucombe's Seedling twenty-seven years old, 12 bushels per tree were once gathered.

Some varieties of apples and plums yielded well last season, and others badly, while gooseberries gave a heavy crop, and cob nuts a light one. Walnuts promised well at first; but most of the fruit dropped off early. Currants, as already stated, were fair crops—black and red alike.

In 1897 about 15,000 bushels of fruit, not including the bulk of the nuts, were produced on the 200 acres. At 50 lb. per bushel, this would be equivalent to 335 tons, and, with the nuts, an average of two tons per acre, as roughly estimated by Mr. Smith, seems well within the mark.

Among the interesting notes in Mr. Smith's statements the more important must be given in miscellaneous style. Cob nuts pay fairly as a rule, and sometimes well. Three good crops had been grown before last year; but the crop of the recent season was expected to be only about half a ton per acre. In 1897 Mr. Smith produced 100 tons from 100 acres. He once grew the great crop of two tons per acre, while his brother produced the enormous crop of three tons. Many growers say that the Stirling Castle variety of apple is of no good to them, as it is such a tremendous cropper that it wears itself out quickly; but at Loddington it is manured heavily, and the trees are gone over twice to cut off superfluous blossom twigs. Thus treated, it flourishes, and gives abundant crops. The Crittenden (cluster) damson yields much better than the old variety. When plums are thick on the trees, thinning them pays well, as the green fruit realises money enough to pay

for the labour. One peck per bush is a fair crop of gooseberries, but half a bushel per bush is sometimes produced. Last season gooseberries started at 8*s.* a bushel, went down to 2*s.* 6*d.*, and rose afterwards to 5*s.* or 5*s.* 6*d.* Gooseberry bushes last twelve or fourteen years, but will not do well longer as a rule. Currants are a little more long-lived. Plums flourish for about thirty years on a soil which suits them. They come to a fair profit six years after planting.

Mr. Smith's opinion is that apples and pears, when thoroughly established, do best on grass, because the roots are not disturbed; but young plantations should never be raised on grass. Cherries do well in grass orchards only as a rule, while plums should be grown on cultivated land. Poultry are considered so useful among fruit trees and bushes at Loddington that they are kept in different parts of the plantations, huts being provided for them to roost in at night. Blackbirds, on the other hand, need keeping down, as they consume large quantities of currants and other fruit. Over a hundred had been caught in three days in traps by one man shortly before my visit.

There is a good deal of piecework for the men employed, who earn about 20*s.* a week. Plums are picked by the "piece," and apples by the day. Women pick most of the gooseberries at 6*d.* per bushel.

Many young men have been sent to Mr. Smith to learn fruit growing, and it would be impossible to find a better place than Loddington for seeing how successful results are to be attained.

At Bean, near Greenhithe, a farm of 240 acres, including 40 acres of fruit, held by Mr. George Youngman, of Maidstone, and managed by Mr. Thomas Russell, an experienced fruit grower, was visited. The fruit consists mainly of strawberries and raspberries, though there is also a little top and bottom fruit. Strawberries are in rows 30 in. apart, and the plants are 13 in. to 14 in. distant from each other in the rows; raspberries, in rows 5 ft. apart and 2 ft. from cane to cane in the rows. Strawberries are planted by drawing a shallow furrow with a light plough called a "pea strike," the plants being placed in the furrow and earth drawn round them with the hands. If set in holes made with dibbles, the roots would be too much contracted. Farmyard or fish manure is chiefly used, the latter at the rate of 4 cwt. to 5 cwt. per acre. Rough stable manure is put on strawberry plants for litter in the spring by some growers; but it is not a commendable plan, clean straw being preferable to protect the fruit from dirt.

Strawberries stand for four or five years; raspberries about ten on the average, the period varying with the soil. The rapidity with which strawberries fall in price as the season advances was illustrated by a drop from 9*s.* a peck to 6*s.* between the Saturday and the Monday preceding my visit. Picking costs 2*d.* per peck for strawberries and ½*d.* per lb. for raspberries. Both fruits weigh about 6 lb. per gallon, raspberries being sold at that rate, while strawberries are not weighed, as a rule, except for the jam factories. Paxton and Royal Sovereign are the strawberries chiefly grown, and Falstaff and Carter's Prolific are the principal raspberries, Norwich Wonder, grown to some extent, being considered too coarse.

In pruning red currants, which bear on the old wood, the new wood is cut off closely, except about 3 in. (two buds) of the leader on each branch, as soon as the leaves have fallen. Some growers tip the shoots in summer to admit air and sunshine. Black currants, as they bear on the new wood, require quite different treatment. Most of the old wood is cut out, leaving parts of branches from which new shoots have grown, but shaping the bushes. A great deal of fruit, largely consisting of strawberries and raspberries, is grown in Stone (of which parish Bean is a hamlet) and Southfleet, and some at Gravesend.

In the Maidstone district the cherry crop was a light one last year; but I found it better in East Kent, which is the great cherry country. On the way to Gushmere Court, Faversham, where Mr. W. W. Berry grows fruit and hops on an extensive scale, cherry orchards were found numerous after passing New Brompton. Some great strawberry fields had been previously traversed from St. Mary Cray onwards, and between New Brompton and Sittingbourne orchards of cherries and apples on grass, and some of mixed top and bottom fruit, were noticed. Near the latter place, which is the heart of the great cherry district, a combination of hops and fruit trees, less common than it used to be, was seen. There is some splendid land between Sittingbourne and Faversham, as indicated by the luxuriance and laid condition of the corn crops.

At Selling, which is Mr. Berry's nearest station, I found myself in the midst of a great fruit and hop country. The soil for the most part is a stiffish loam over brick earth, with a chalk subsoil 8 ft. to 9 ft. below the surface. Fruit does well with such a depth of soil before the chalk is reached, but not where the latter is near the surface. The price of land varies from 30*l.* to 150*l.* an acre when disposed of in considerable quantities; but small holdings with fruit upon them or suitable

for fruit are much dearer. For example, half an acre of land with a tumble-down cottage upon it realised 140*l.* shortly before my visit. As it lets at 10*l.* per annum, it is not a bad investment at the price. Fruit plantations in full bearing let at 8*l.* to 10*l.* an acre, and the land of one that I saw, only five years planted, had been bought at 55*l.* an acre, and would now let at 6*l.* per acre. A good cherry orchard, Mr. Berry says, is worth 300*l.* an acre, if in full bearing. One farmer in the district has 60 acres of cherries; another near Sittingbourne holds a still larger extent of young trees; and a landowner who has farms in hand has 100 acres of this fruit. Fruit growing appears to pay in the district, and workmen who have saved money occasionally obtain a small holding, and do well at the industry; but hops, when well managed, according to the occupier of Gushmere Court, pay better than fruit.

Mr. Berry farms 600 acres of land, 70 acres being in fruit and 180 acres in hops. Nearly all the fruit plantations, except about 20 acres of cherries on grass, consist of top and bottom fruit, chiefly apples, plums, and gooseberries, with a smaller quantity of currants and a few strawberries. No raspberries are grown on the farm. On about 35 acres the bottom fruit consists of gooseberries, the most important fruit crop on the farm.

In reply to a question as to the approximate cost of planting an acre of top and bottom fruit, taking a mixed plantation of apples, pears, plums, and gooseberries or currants, as an example, Mr. Berry, off-hand, put the items as follows:—

	£	s.	d.
Steam cultivation	2	0	0
Trees (120) and planting	12	0	0
Gooseberries or currants (1,200) and planting	12	0	0
Manure	5	0	0
Total	31	0	0

Steam cultivating for fruit means ploughing 9 in. deep and subsoiling 12 in. deeper. Of course the subsoil is only stirred, and is not brought to the surface. As for the manure, if London dung were used, the cost would be fully 7*l.* an acre, including carting. But Mr. Berry would reserve this for the hops, and use for fruit one ton of wool waste and half a ton of bone meal, costing under 5*l.* If small trees and bushes were used the cost would be about 12*l.* an acre for them, including planting, with 5*l.* for manure, and presumably 2*l.* for steam cultivation, making 19*l.* in all; but this plan is not recommended. No doubt, however, growers who raise their own

trees and bushes plant well for much less than 31*l.* an acre. For the first three or four seasons strawberries may be grown to give a quick return. The gooseberries or currants will yield nothing in the first year, a little in the second, and a good or fair crop in the third. The planting of trees and bushes can be done from the autumn up to March. Strawberries are usually planted in March, but sometimes in the autumn. Very little fruit is to be expected in the first year from strawberries—indeed, none worth mentioning; but good crops should be grown in the second and third years, after which, or at any rate after the fourth year, the trees and bushes will shade the land too much for strawberries. Even in the open Mr. Berry is of opinion that strawberries should not be left after the third year, though they often stand four years.

On the question of the duration of different fruits, Mr. Berry said that raspberries would stand 14 to 15 years, plums 20 to 25, cherries 60 to 70 on suitable soils, and apples up to 100 years. Gooseberries and currants are commonly left 12 to 14 years under fruit trees, but would last longer if required. Trees usually cover the ground almost completely in the period named, and the land is often laid down to grass. With respect to fruit on grass land, Mr. Berry's views correspond closely with those of Mr. F. Smith, already given. Cherries always, and apples generally, he said, do best on grass, and most plums on arable land, though some plums grow fairly in pasture. Napoleon and Bigarreau cherries flourish better than most other varieties on arable land. Although the point was not put to him directly, it may be assumed that he would not recommend the planting of any fruit on grass, as all his directions indicate planting in arable fields. It is only after even cherries and apples are well established, and their roots have penetrated below the depth from which grass exhausts most of the fertility in the soil, that grass should be allowed to compete with them for nutriment.

As to distances, Mr. Berry recommends 30 ft. by 30 ft. for cherries, 20 ft. by 20 ft. for standard apples or plums, 12 ft. by 12 ft. for half-standards, 6 ft. by 6 ft. for gooseberries or currants, 5 ft. by 2 ft. for raspberries, and 3 ft. by 1 ft. 3 in. for strawberries.

The principal apples grown on the farm are Lord Suffield, Domino, Irish Peach, and Worcester Pearmain as early varieties, and Bramley's Seedling, Blenheim Orange, and Cox's Orange Pippin as later sorts. Blenheim Orange does fairly after once coming into bearing. The apple crop was a very poor one last season, and the only varieties among those named which gave

good crops were Worcester Pearmain and Bramley's Seedling. The latter had been grafted on Wellington, which was given up because it cankered on this farm. Nearly all Mr. Berry's apples are on the crab stock, as he desires the trees to grow freely and occupy the land fully, in order that it may be laid down to grass ultimately. Clapp's Favourite is the principal pear grown, as it is a good cropper, and sells well. One other local variety, called Chissel, is also grown in fair quantity. The pear crop last year was an extremely poor one.

Early Rivers, Victoria, the Czar, Early Orleans, Prince of Wales, July Greengage, and Monarch are the chief plums. The crop last year was the best Mr. Berry has ever grown.

The most important cherries, putting early varieties first, are Governor Wood, Knight's Early Black, Frogmore, Black-heart, Black Eagle, Waterloo, Amberheart Bigarreau, Napoleon Bigarreau, and Turk.

Berry's Early Kent is the gooseberry which does best at Gushmere Court as the earliest for picking. In April last year it made 8*s.* a peck. It is a chance variety of unknown origin, and is of value chiefly to sell green, not being recommended as a sort to be ripened. Lancashire Lad and Whinham's Industry both flourish and bear well, but are comparatively late. The former is better than the latter to sell when ripe, while Crown Bob is better still to eat, if not to sell. Some very fine dessert gooseberries of the Gunner variety are also grown. Of the red currants, Fay's Early is regarded as the best early variety, La Hâtive, Early Dutch, Late Dutch, and Scotch Red being also cultivated. Baldwin and Champion are the black currants; Paxton and Royal Sovereign the only strawberries.

Mr. Berry has a little station on a running stream in which he makes washes for injurious insects on fruit or hops. For aphis he uses 8 lb. of quassia chips and 10 lb. of Scotch whale-oil soap to 100 gallons of water. He has a large boiler, in which he stews the chips for three days, boiling the soap separately, and there is a great cistern in which the mixture is stored. When water is hard, 1 lb. of soda should be used to soften 100 gallons. For red spider, 1 lb. of liver of sulphur to 100 gallons of water is used. For caterpillars Mr. Berry uses Paris green where it can be applied with safety, and "Paranaph" (a preparation of paraffin, naphthalin, and soap, recommended by Mr. Cousins, of Wye College) elsewhere. At Malling four acres of gooseberries were condemned a few years ago by the health officers because the illness of a family in London, after eating gooseberry pie, was traced to the fruit referred to, which grew under trees that had been sprayed with

a solution of Paris green. Usually, however, according to Mr. Berry, the spraying is finished before the gooseberries are formed. He does not grease-band his trees, as he has suffered from the practice in the past, through injury to the bark; and at best it is only partially effective.

Nearly all the pruning is done during the late portion of the autumn and in the winter; but dwarf trees are occasionally pruned in summer, while red and white currants are trimmed in the first week of July, to facilitate the ripening of the fruit and the young fruit buds.

Among the several fine plantations noticed was one of apples 12 ft. by 12 ft. apart, and gooseberries 6 ft. by 6 ft., now five years old and promising well. Another had cherries and plums 30 ft. by 27 ft. apart, with gooseberries and strawberries as bottom fruit. After the fourth year the strawberries will be dug up. In a large cherry orchard, in grass, the cherry trees are 30 ft. apart each way, with plums between the rows, so planted that each plum is opposite the middle of the vacant space between two cherries. Ultimately the plums will die out or become too old to be profitable, and the cherries will remain alone. Cherries sell at 1½*d.* to 5*d.* per pound wholesale, according to season and variety. There was a fair crop of cherries in the excellent orchard just noticed, with a good crop of plums. As cherries were selling well and plums were likely to sell fairly, it was estimated that the two crops would amount to a good sum per acre. Probably no other fruit crop in the open comes to as much money as cherries when there is a good yield, and cherry growing pays well where the soil and climate are both suitable. About three-fourths of the cherries grown in England are produced in Kent.

Wages for labourers in the district are 14*s.* to 18*s.* a week. All but a few old men receive 18*s.* on Mr. Berry's farm, and they earn a good deal extra at piece-work—up to 4*s.* a day. Women get 1*s.* 4*d.* to 2*s.* a day. Piece-work prices are usually 1*l.* per ton or 6*d.* per bushel for gooseberries, 8*d.* per bushel for red currants, 1*d.* per 3 lb. or 4 lb. of black currants, or 1*d.* per 2 lb. free from stalks for jam, 2*d.* per peck for strawberries, 1*d.* per 3 lb. or 4 lb. of raspberries, and 1*s.* per bushel for cherries.

Mr. Berry sends most of his fruit to Manchester and Liverpool, but some to Newcastle and other northern markets. None is sent to London. The condition, appointments, and management of his great farm are admirable.

In all the districts of Kent visited, fruit growing has been, and still is, extending considerably. Some of the old orchards

are not up to the modern standard; but the new ones are generally planted with the best varieties of hardy fruit, and well treated. Mr. Bunyard, of Maidstone, who has a very large and splendidly managed nursery, has introduced many new varieties of fruit to Kent growers. If nurseries were not beyond the scope of this report, a description of Mr. Bunyard's important enterprise would be an agreeable task. Other Kent plantations than those described above were seen; but space is not available for further details concerning fruit growing in that county.

Fruit Farms in Cambridgeshire and adjoining Counties.

Under the valuable guidance of Mr. Arthur Bull, of Cottenham, many of the fruit plantations of that parish and of Histon, adjoining, were seen early in the season. A large portion of the land in Cottenham is on the Lower Greensand, the best of all formations for fruit. Bare land suitable for fruit is worth 60*l*. to 120*l*. an acre, and quite half the land in Cottenham is owned by the growers. Twenty years ago agricultural rents in that parish were 50*s*. to 60*s*. an acre, which shows that the soil is of high quality; but they are lower now except for fruit land. At the beginning of that period many small occupiers paid 6*l*. an acre on a lease of fourteen years to leave the fruit trees and bushes at the end of the term. This was a bad bargain for the tenants, and a very good one for the landlords—all small owners—as planted land in full bearing is worth at least 8*l*. an acre in rent. But fruit paid remarkably well twenty years ago, and men with a little money were eager to engage in growing it.

About 1,000 acres of land are under fruit in Cottenham, and about the same area is devoted to asparagus, which, however, is giving place to fruit to some extent. Nearly all the fruit has been planted within thirty years, progress having been equable all the time. Plums and gooseberries are the kinds of fruit most extensively grown, with fair quantities of apples, currants, and raspberries. Strawberries are also cultivated under the fruit trees, as well as bushes, for a few years after a plantation has been started, and a small acreage besides is grown in open fields. Pears and cherries also are cultivated on a small scale, but hardly any damsons, as they are considered unprofitable.

There are many small holdings, some only 2 or 3 acres, and others 7 or 8 acres, while few men hold more than 20 acres, and not more than two over 50 acres. Some of the men who have purchased 2 or 3 acres for fruit growing farm large

holdings as tenants, growing ordinary farm crops. In reply to a question as to the smallest area of fruit land on which a family could be supported, Mr. Bull said he thought that owners of 6 acres saved some money.

The distances at which fruit-trees are planted vary greatly. Some of the half-standard plums and apples are 15 ft. by 12 ft., and other trees (possibly standards) 30 ft. by 15 ft., with gooseberries or currants, and sometimes strawberries also, as bottom fruit. These are good distances, and it was pleasant to see that the orchards were not overcrowded. Generally they presented a very flourishing appearance. The varieties of apples and plums grown are numerous. Victorias are the plums most extensively cultivated, Rivers's Early Prolific coming next, and Czar and then Gisborne, with other sorts in smaller quantities. No list of the apples was obtained. Superphosphate and kainit are used a good deal for manuring fruit, as well as farmyard manure. Black currants are less grown than they were formerly, the mite having destroyed a large number of bushes.

Growers have a great advantage in the lowness of wages, which are only 11*s.* to 12*s.* a week, apart from extra earnings at piecework and in harvest time.

About half the fruit sent out of the district goes to London, most of the rest to Manchester, and some to Birmingham and Yorkshire markets. A considerable quantity, however, is sent to the jam factory at Histon, owned by Messrs. Chivers. There are competing railway systems to northern markets; but still growers complain of high rail rates and the careless handling of fruit. They are fairly prosperous, however, Mr. Bull said. Prices for fruit have varied greatly, but have not fallen, he added, during the last twenty years. In reply to the question whether the system of distributing fruit was satisfactory or not, he said he did not know how to get a better one. Fruit is sold on commission of 10 per cent. or less; but the precise amount was apparently not regarded as an item of information for public use.

Mr. Bull himself has 40 acres of fruit land, partly his own. He planted the first 8 acres twenty-two years ago. His plantations, so far as could be seen in a pouring rain, are healthy and well cultivated. He had a great number of poultry in one of them, and said that he believed they did good. Victorias and Early Rivers plums bore heavy crops last season; but Czar and Gisborne were more or less blighted, and yielded accordingly, while the crop of greengage plums was thin. The apple crop was a light one.

At Histon, I was informed, there are about 310 acres under

fruit, mainly held by Messrs. Chivers, and the rest by a few small growers. There is no commercial hot-house industry in Cottenham or Histon.

One of my most instructive visits was to the admirably managed fruit plantations of Mr. I. F. Thoday, of Willingham, Cambs. There are about 200 acres of fruit in that parish, besides what small growers cultivate, which cannot be easily estimated. Mr. Thoday has 45 acres under fruit, and is the largest grower in the parish. His father started the industry there thirty-seven years ago, and it is still extending. The purchasing price of land runs up to 100*l*. per acre, and rents are astonishingly high for a rural district, 2*l*. 10*s*. to 5*l*. per acre for land close to the village, while ordinary farm rents in the district are 30*s*. to 50*s*. The soil is a medium loam of good depth, with a subsoil of clay in some places and gravel in others. It appears to suit fruit remarkably well. Growers mostly own the fruit land, and Mr. Thoday owns most of his plantations.

Mr. Thoday grows Sutton's Earliest of All tomatoes, outdoors, and in one year he produced 50 tons. His top fruit consists chiefly of plums, though he also grows a few apples and more pears; and gooseberries and raspberries are the principal bottom fruits. Very few apples are produced in Willingham. Mr. Thoday does not find them remunerative, probably because the district is not well suited to them. He has but one acre of strawberries, which are cultivated only in a few small patches in the parish. Damsons are grown only to a very small extent there, as they do not pay well, and there are not more than twenty cherry trees in the parish. Mr. Thoday has a good many greengage plums, the principal other varieties being Rivers's Early Prolific and Czar. Old sorts, he says, are no good for market. The pears most commonly grown by him are Hessel, Pitmaston Duchess, Buerré du Capuchin, Louise Bonne, and Marie Louise. Whitesmith and Crown Bob are the chief gooseberries. Some red currants are grown and a few blacks; but the mite plague has reduced the cultivation of the latter.

A striking contrast was noticed between one of Mr. Thoday's new plantations and an adjoining one of the old varieties of plums and pears. The distances of his fruit trees vary greatly, and, although he strongly objects to crowded orchards, he appears to doubt whether thick planting in the first instance, and the removal of every other tree when necessary, is not more profitable than thin planting. But, for standard plums, he named 20 ft. by 15 ft. as good distances when gooseberries or currants are grown between. He showed me a neighbour's orchard of plums and gooseberries, however, in

which the trees are only 10 ft. by 8 ft., and in some places 10 ft. by 6 ft., as one of the most profitable in the parish. It is but eight acres in extent, and he thinks it yields a profit of 400*l.* in a good year. But every other tree now needs to be cut out, or the orchard will certainly deteriorate. Mr. Thoday himself made 800*l.* on one occasion of 10 acres of plums. Another highly remunerative crop was 50 tons of gooseberries from 7 acres, with top fruit besides. Yet another was two tons of raspberries from an acre and a quarter of land, sold at 25*l.* a ton.

A very fine orchard of plums and pears, with gooseberries underneath, attracted my attention in a walk round the farm. Still more striking was a splendid lot of Early Rivers and Czar plums, with raspberries as a bottom crop. This orchard is situated where asparagus, heavily manured annually, had been grown for twenty years. The plums are now only four years from the planting, and look like trees six to eight years old. They are 12 ft. by 10 ft. apart, and will be too thick when fully grown. Four years hence Mr. Thoday expects to have to cut out every other tree; but in the meantime he will have been getting fruit from the whole of them. A third excellent plantation is a new one of plums, with raspberries and goosebeeries alternately in the tree rows, and the former alone between the rows. The raspberries will be allowed to stand only five years, or seven at the most, and then will be renewed, in accordance with Mr. Thoday's usual custom—a very uncommon one, I believe. By way of contrast, close to the new orchard is an old one planted with top fruit and gooseberries twenty-seven years ago, the bushes being as old as the trees.

For red spider on gooseberry bushes, Mr. Thoday uses a wash composed of London purple, paraffin, and Sunlight soap. Lime-dust is thrown on gooseberry bushes when wet every alternate year, to kill lichen. Grease-banding is general in the district, for plums as well as apples, and it is considered useful. Farmyard or artificial manure is applied to fruit annually, the latter consisting of muriate of potash, superphosphate, and either nitrate of soda or sulphate of ammonia.

Gooseberry picking is done chiefly by women at 1*s.* 2*d.* a day and girls at 1*s.* The wages of labourers in the district are only 12*s.* in summer, and 10*s.* to 11*s.* in winter; but garden-men get 1*s.* more, and all receive extra at piecework and in harvest. Mr. Thoday sends most of his fruit to Newcastle; but he has daily telegrams in the busy season from the principal markets in the country, and places his produce accordingly. Nearly half of the fruit grown in the parish, however, goes to London, and most of the rest to Manchester (chiefly), Yorkshire,

Birmingham, the west of England, and Glasgow. Except for somewhat short crops of greengages, apples, and pears, the past fruit season was one of abundance.

Prices for fruit are lower than they were twenty years ago, according to Mr. Thoday, but not lower than those of ten years ago, though they vary greatly in different seasons. In this he differs somewhat from Mr. Arthur Bull. He hardly knows whether fruit growing is overdone or not. Mr. Bull answered in the negative.

Fruit is grown in the open at Over, adjoining Willingham; also at Haddenham and Ely. Greengages are produced extensively at Eversden and Melbourn, near the town of Cambridge.

In the Wisbech district, according to an authority in the neighbourhood, there are fully 6,000 acres of land under fruit, most of it being in Norfolk, but some in Cambridgeshire. Eighty tons of gooseberries have been despatched from Wisbech Station in one day. Strawberries and raspberries are very extensively grown, and Mr. Richard Bath and his partners, whose great fruit and flower farms were visited, gathered 40 tons of strawberries in one day in 1896.

The two firms of which Mr. Bath is head hold 900 acres of land, about 850 acres, as the foreman of one of the firms estimated, being under fruit, including 210 acres of strawberries. The fine alluvial soil (some of it let at 3*l.* an acre) is perfect for raspberries, and apparently suits other fruits also. Very little fruit, according to my informant, was grown in the district sixteen years ago, when Mr. Bath started his great enterprise. As the farms were visited mainly for flowers, only a short time was spent in the fruit plantations. In one fine orchard of half-standard apples the trees were found to be 18 ft. apart each way. Yellow Ingestrie, Counsellor, and Lord Grosvenor are the varieties in this orchard. Gooseberries are most extensively grown as bottom fruit. Of this district, Mr. Thomas Rose, agent to Mr. E. S. Trafford, says that the estates of that landowner in Cambridgeshire and Norfolk around Wisbech embrace the greatest fruit district of the Eastern counties.

At St. Ives, Mr. Phillips, who grows 60 acres of fruit, and has been engaged in the fruit trade for fifty years, favoured me with some information about the industry in the district. His own plantations are in Bluntisham, Hunts, and there are several other growers in that parish; also at Earith, Colne, Hemingford, and Somersham in the same county, while raspberries especially are extensively cultivated at Chatteris, in Cambs. Some growers have 100 to 120 acres of fruit. Apples,

plums, greengages, pears, cherries, gooseberries, currants, strawberries, and a few raspberries are grown in all the parishes, but plums and gooseberries most extensively. As in so many other districts, black currants are produced to a smaller extent than they have been, on account of the ravages of the mite. As to the increase in fruit cultivation, there are 20 acres now devoted to it where there was only one acre twenty years ago, and nearly 100 acres of new plantations have been made in one parish during the last two years.

In another part of Hunts than the districts near St. Ives, it may here be mentioned,—in the market gardens in and around St. Neots,—fruit is grown to some extent, though vegetables are much more commonly produced.

Mr. Phillips, in noticing the distinction between greengages and greengage plums, said that many were not grafted, but that, to obtain the real greengage flavour, grafting is necessary. The ungrafted trees bear most abundantly. Frost, he added, is not often seriously damaging to plums, except to the early blossoming varieties. The Black Diamond was named as a plum early to blossom and late to ripen. The Victoria, Early Rivers, and Greengage varieties are extensively grown.

With respect to prices, Mr. Phillips said they were lower than they were twenty years ago, but had not fallen as a rule during the last ten years. Twenty years ago 10*l.* a ton was the lowest price for gooseberries, but in some recent years it has been down to 4*l.* The chief markets for fruit grown in the district are Bradford, Leeds, Scotch towns, and Cardiff; also London when supplies are short there. Rail rates he described as very high. Gooseberries, for example, are rated at 27*s.* 6*d.* per ton to Bradford, even when they are worth only 5*l.* a ton, and they cost 20*s.* to 30*s.* a ton to gather. Rates to London are 20*s.* a ton for gooseberries, and 15*s.* for apples. It was suggested that fruit sent to jam factories might go at owner's risk and at reduced rates.

A considerable quantity of fruit is grown in the Boston district of Lincolnshire, which I visited, however, for bulb farms rather than for fruit.

Market Gardens and Orchards at Evesham.

Forty years ago potato growing was the great industry at Evesham, and very little fruit was produced there; but during that period, and mainly within the last twenty years, fruit planting has been constantly extending, and now there must be considerably over 1,000 acres within a few miles of the

prosperous little Worcestershire town. The area, however, is difficult to estimate, because a large proportion of it is occupied by a great number of small holders, most of whom grow asparagus and other culinary vegetables as well as fruit; also because there are many scattered orchards a few miles from the town. Thousands of acres of asparagus, a high authority informed me, are still grown in the district, although this industry, in consequence of the damage done by the asparagus beetle and blight, is not as profitable as it was formerly.

The soil in the district is for the most part a fine loam over the gravel, or over the clay on the hills. The land is chiefly in the hands of somewhat large owners, and very little is sold, except for building, for which purpose, close to the town, it sells up to 1,000*l.* an acre. In one case a few acres quite away from the town, though near a railway station, were sold recently at 320*l.* an acre. But the price depends largely upon suitability to market gardening or fruit growing, as one farm that I saw, only about two miles from the town, was bought at less than 100*l.* an acre a few years ago, when it was an ordinary corn farm. Neither soil nor aspect is very good for fruit, with which it has been planted; but the trees have grown fairly, and the farm is considered to have been a great bargain. The rent of market-garden land close to the town, before being planted with fruit, is 4*l.* to 5*l.* an acre, while planted land is worth 8*l.* to 10*l.* per annum. Even the farm of 600 acres, formerly held by the late Mr. Randell, of Chadbury, three miles or more from Evesham, chiefly or wholly in Fladbury parish, is now let to market gardeners in lots of 20 to 25 acres, at 3*l.* to 5*l.* an acre.

Although the rents of planted fruit land have been mentioned, these are charged only when the landlord originally planted the trees, or has bought up the tenant's right in them; for an interesting system of tenant-right prevails in the Evesham district, under which a quitting market gardener or fruit grower sells his interest to a successor approved by the landlord, either at the old rent or at an altered one agreed upon by the landlord and the new tenant. Leases are uncommon, and the man who has paid 40*l.* to 60*l.* (the usual payments for orchards in full profit) for the tenant-right of a fruit plantation depends upon the good faith of his landlord not to turn him out or raise his rent on the improvements he has purchased or made. Even if turned out, or if leaving on account of an increase of rent, the tenant would be able to sell his tenant-right, though its value would be diminished by a rise of rent. Before the Market Gardeners' Act was passed a tenant had no legal security for his outlay in planting, unless done with the landlord's consent, or unless the

custom of the district was old enough to have acquired the force of law. Instances of the infringement of the custom, however, appear to have been very rare, if any occurred. The Market Gardeners' Act is now a protection against injustice, although its advantages to an out-going tenant are regarded as inferior to those afforded by the custom, while the landlord is not likely to be anxious to pay down a heavy sum in compensation.

It is satisfactory to learn that fruit growers in the district are generally prosperous, and vegetable growers likewise; many get a living from 5 acres of fruit trees and the crops grown between and under them, working themselves and employing four or five men also. Twenty acres of fruit are considered as making a large business in Evesham, and no one, so far as I can learn, has over 30 acres of fruit alone. At a few miles distant, however, and in the neighbourhood of Salford Prior, fruit plantations are larger, and one grower has about 100 acres. The labourers earn fair wages for a place in the midst of a great agricultural neighbourhood. In Evesham they get 17*s.* a week, and in parishes just outside 16*s.* Women have 1*s.* 6*d.* a day, but work mostly by the piece.

The extensive use of hand-lights is one of the most striking features of the Evesham market gardens. They are used to protect such tender crops as cucumbers and vegetable-marrows. Tomatoes, too, are grown by the acre outdoors—probably much more extensively than anywhere else in England. Rhubarb, also, is very extensively cultivated. The land is almost ceaselessly cropped, and thus large returns are obtained from it in the course of a year. As an illustration of good returns occasionally obtained, it was stated by one grower that he had made 40*l.* a year or two ago from half an acre of parsley. There are "downs" as well as "ups," however, for 3 acres of parsley were disposed of for 50*l.* in 1897, and last year the crop was worth so little that it was fed off by sheep. In another case a crop of spring onions grown between rows of raspberries brought in 80*l.* an acre. Such windfalls explain the ability of Evesham market gardeners to pay high rents and large sums for tenant-right, and yet to get a living off a few acres.

After a number of the small market gardens had been seen, Mr. H. Masters, one of the most extensive fruit growers, was visited. He has about 26 acres of fruit on his farm of 52 acres, about half of which is devoted to vegetables. Although very busy, Mr. Masters was obliging enough, not only to show me his own orchards, but also to drive me round to see many others. His father, thirty-five years ago, was a pioneer in planting fruit on high ground, the comparatively small area at

that time being in the valley. Noticing that potatoes were not frosted on high ground when they were cut badly in the valley, the late Mr. Masters began planting in a comparatively elevated situation, and now such sites are in great demand. My informant prefers a south-eastern aspect to any other if it can be obtained.

The most important fruit crop in the Evesham district, according to Mr. Masters, is the egg (or Pershore) plum, and the next (in Evesham, but not so much in the outlying parishes) the Damascene or Worcester damson. Apples rank next in importance among tree fruits, and then cherries, pears not being grown to a large extent. The great size and flourishing condition of the old plum trees in the district are remarkable, and the suitability of the soil and climate to this fruit is further shown by the long life of the trees. Mr. Masters has some giants nearly forty years old, and still full of vigour. He has had six or seven pots (of 72 lb.), or 430 lb. to 500 lb., off a single Damascene tree in a very prolific season. The Victoria is most commonly grown, next to the two varieties mentioned; after which come Rivers's Early Prolific, New Orleans, Czar, Cox's Emperor, and Monarch. Mr. Masters says that 12 ft. by 12 ft. are good distances for plums; but in one very fine plantation of 18 acres, all plums except 2 acres of apples, the trees are 15 ft. from row to row and 9 ft. apart in the row, with two rows of gooseberries between the tree rows and one in each tree row. The plum trees in this young plantation are chiefly of the bush shape, which Mr. Masters is disposed to prefer, because they are less liable than standards to injury from wind. The gooseberry bushes are about 5 ft. apart. The crop of egg plums at Evesham last year was a splendid one, and there were good yields of Victoria and Rivers's Prolific. Of this last-named variety, which Mr. Masters himself grows most extensively, he had a very fine crop.

Most growers at Evesham raise their own fruit trees, as nurserymen's trees are usually budded or grafted on a wild stock, and the growers find the egg plum stock the best to work upon. For bearing fruit of its own variety this plum needs no grafting. Its suckers, growing from the roots, are planted out for one year or two years, and then grafted or budded if another variety is desired. Grafting is done in the latter part of February and in March—chiefly in the latter month; budding in July.

A very flourishing young plantation of apples 18 ft. by 15 ft., with gooseberries as bottom fruit, was seen, and a still younger one in a field of asparagus. Black currants are to be

planted as bottom fruit when the asparagus plants are dug up. The black currant mite is troublesome in the district, and some bushes have been grubbed up on account of it. The gooseberry, however, is by far the most important bush fruit in Evesham.

Strawberries are not grown upon a large scale at Evesham, though a great many market gardeners have small pieces. Mr. Masters has 8 acres, which is considered a large breadth in the district. Raspberries are produced to a small extent only.

Mr. Masters had two acres of outdoor tomatoes of the Early Evesham variety, a slightly wrinkled kind, not so large as the Old Red, but much earlier. The plants were raised in a hot-house, and set out in rows 3 ft. 6 in. apart, the plants being about 1 ft. 9 in. apart in the rows. Last year 16 tons were gathered from two acres, besides a quantity of waste. The crop is a somewhat uncertain one; but, when 8 tons per acre are produced, it must be an extremely profitable one. Probably such a yield is rare. Outdoor marrows are grown by the acre, and a few outdoor cucumbers, but the latter do not pay well, hot-house produce being too plentiful. Both marrows and cucumbers sell at about 1*s.* a dozen. In another market garden tomatoes growing on asparagus beds were noticed.

Young fruit trees are pruned in the autumn and winter; but after a few years they require only a little trimming to keep them in shape. The manures used for fruit are chiefly soot, fish guano, blood manure, and phosphates. Basic slag is coming into use as a phosphatic manure.

Mr. George Jones, who occupies part of the late Mr. Randell's farm, has also two small gardens in Evesham, and another at Pinvin, close to Pershore Station, making about 36 acres. Between the town and Fladbury fruit plantations were seen on either side of the road for the greater part of the three miles, or thereabouts, and, at intervals, they extend considerably further. One of the first crops noticed in the Fladbury garden was a large bed of rhubarb, grown two years and then taken up for forcing, after which the old roots are used as stocks again outdoors for fresh plantations. The garden is not nearly all planted with fruit, asparagus being largely grown with various other vegetables. One acre of outdoor tomatoes, 2 acres of strawberries, 2 acres of raspberries, a large patch of plums, a few apples and pears, and a young plantation of cherries are among the fruit crops. Cherries, although not much grown in the district, do well at Fladbury, in proof of which Mr. Shepherd, the foreman of this market garden, gave a striking example. He had seen the accounts of a neighbouring plantation of one acre for seven years, and the average return of the cherries,

sold by auction, the buyer to do the picking, was 50*l.* per annum. The highest return was 86*l.*, and the lowest 35*l.* Since these high returns were obtained the trees have deteriorated.

Strawberries, Mr. Shepherd said, were less grown in Evesham than they used to be, because of the fall in prices. Twenty years ago, he added, the first pickings usually made 10*s.* a dozen punnets; last year the start was at 6*s.* At the earlier period the crop realised 40*l.* to 50*l.* an acre, but now it seldom makes over 25*l.* He hoped, however, to get 40*l.* per acre for Royal Sovereigns.

There is no glass worth mentioning in the Evesham district, though some market gardeners have a small hot-house or two and a few heated frames for raising tomatoes, cucumbers, and marrows.

Fruit growers at Evesham feel it a hardship that the railway company charge passenger train rate on any lot of fruit less than half a ton. The company used to run a truck for 3 cwt., and growers think they should run one for 5 cwt.

THE PERSHORE FRUIT DISTRICT.

The Earl of Coventry, as President of the Royal Agricultural Society, kindly interested himself in my investigation of the fruit industry, and invited me to visit his Croome Court Estate, in the Pershore district of Worcestershire. Under the obliging guidance of the Earl's agent, Mr. Hill, who gave a great deal of information about the district, a visit was first made to the jam factory, close to Pershore Station, established and worked for a few years by Lord Coventry for the benefit of his tenants, but now in the hands of Messrs. Beach & Son. The factory is small, but well appointed, and everything was found perfectly clean and conveniently arranged. Jam-making was finished for the day, but fruit was coming in for the following day's work. Mr. Beach, junr., said that in consequence of the abundance of plums in the district he expected to be able to obtain them for 2*s.* 9*d.* or 3*s.* per pot of 72 lb., instead of 9*s.* to 10*s.* paid in the previous year; but it is doubtful whether they came down to such low prices during the season, and Mr. Cosnett, one of the Earl of Coventry's tenants, made 16*s.* 6*d.* per pot as a starting price at Birmingham for Early Rivers. The Pershore, or egg plums, however, are cheaper, although they do well for jam, and there was a tremendous crop of them in the district. Some had been sold by contract for 3*s.* 6*d.* a pot. In conversation with Mr. Hill and Mr. Beach, I learned that, next to plums,

for which Pershore is noted, apples are most extensively grown as tree fruit, with gooseberries, red and black currants, and a few white currants. But most of the apples and pears are grown in farmers' orchards for cider and perry. Hardly any strawberries or raspberries are grown, and not many cherries. At one time cherries were the chief produce at Pershore, and the story runs that, when a native was asked whence he came, if the cherry crop was a good one he proudly replied, "Pershore, what do you think?" But if there was a poor crop of cherries, the answer was, "Pershore, God help us!" Now these old sayings apply to the plum crop.

The next visit was to the excellent fruit plantation belonging to Mr. George Jones, of Evesham, which is at Pinvin, close to the jam factory. It is only 8¾ acres in extent; but the quantity of fruit in it was surprisingly large. The soil, as in the district generally, is a strong or medium loam of fair depth over the blue lias clay, with yellow clay intervening in some places, and suits plums admirably. In one part of the plantation plums are grown 15 ft. by 12 ft. apart, with apples round the outside of the piece, but the usual distances for plums in the orchard are 12 ft. by 12 ft. Gooseberries chiefly, but also some currants, are grown as a bottom crop, either in two rows between each pair of tree rows, or one between the pair and one in each tree row. The crop of plums was a very heavy one. The Pershore is most extensively grown, with Early Rivers, Victoria, Czar, and a few other varieties. In the order of picking, Mr. Jones's very capable foreman, Mr. Huxley, put the varieties as follows:—Early Rivers, Czar, Victoria, Pond's Seedling, Winesour (or date plum), and Coe's Golden Drop, with a few of Coe's Late Red. Monarchs are now being grafted, and there are a few greengage plums. The soil of the district is so well suited to plums, Mr. Huxley said, that trees live for fifty years. There are some in the orchard twenty-three years old in full vigour. The first picking of Early Rivers was on July 19. There was a splendid crop of Czars, only five years from the budding.

In a piece of apples and plums, planted alternately, it was remarkable to see some Lord Grosvenor apple trees, only four years from the grafting, quite loaded with fruit. They were grafted on Normandy Pippin trees, the heads of which had been cut off because they canker badly in the district. Lord Suffield cankers badly also, because, it is supposed, there is too much iron in the subsoil. The chief varieties which do well at Pinvin are Keswick, Worcester Pearmain, Lord

Grosvenor, and Lady Henniker (though it crops only every other year).

Seven acres of the plantation are occupied by gooseberries as bottom fruit, and 530 pots (17 tons) had been picked off that area, while enough remained as ripe fruit to make up an average of $2\frac{1}{2}$ tons per acre. The principal varieties are Crown Bob for selling early, Whinham's Industry, Lancashire Lad, Keepsake, and a few Warringtons for ripe fruit, for which Lancashire Lads also are held over to some extent. Some of the bushes are twenty-three years old. Others planted only three years before the past season, when they were a year old, had a tremendous crop. They bore fairly in the second year. These were Lancashire Lads. Over 200 pots of Whinham's Industry were picked off one acre, and none of them sold at less than 4*s.* a pot, so that the return on this acre for bottom fruit alone was over 40*l.*

Plum and apple trees are grease-banded twice in the season, in the first week of October and at the end of March. This does good beyond doubt, Mr. Huxley says. Spraying with a solution of soft soap and paraffin is resorted to when necessary, which was not the case this season. Pruning is done in the autumn, as there is no time for the work in summer, the trees being thinned and trimmed as much as is desirable.

Mr. Cosnett, already mentioned as one of Lord Coventry's tenants, has 50 acres on the estate and some land elsewhere, his fruit area being about 20 acres. He grows plums, apples, pears, gooseberries, and currants. Cherries, he said, were not grown in Pershore for market now. He had a fine crop of plums of the Pershore, Early Rivers, Cox's Emperor, Pond's Seedlings, and Old Orleans varieties, but a thin one of Victoria. His crop of gooseberries was the biggest he ever saw, and his years are not few. He said he had picked about 200 pots of Whinham's Industry from an acre. This would be nearly $6\frac{1}{2}$ tons per acre, an enormous quantity. The bulk had been sold at 7*l.* a ton. Keepsake gooseberries are very big, but poor in quality. Good crops of both red and black currants were produced last season.

Mr. Cosnett, who is noted as a fruit grower in his district, and has won many prizes at shows, says that 12 ft. by 12 ft. are the proper distances for plums. An object lesson as to the harm done by putting grease on to the trunks of trees without bands was afforded Mr. Cosnett before he had learned the danger of so acting. The trees were badly injured.

While driving to Croome Court, Mr. Hill stated that there were about 500 acres of fruit in Pershore and a large acreage

in the surrounding parishes. Agricultural rents near Pershore are 20*s.* to 30*s.* an acre, and 15*s.* further off. Fruit plantations let at 5*l.* to 8*l.* an acre.

There was much to see at Croome Court and in the grounds, besides the fruit plantations, including a beautiful kitchen garden of extraordinary size. The Earl of Coventry was good enough to show me many objects of interest, and to accompany me to the fruit plantations, 40 acres in extent. They consist of plums and apples, planted alternately—a very good plan—with black currants as the only bottom fruit, as less liable to the depredations of birds than gooseberries or red currants. As the plantations are isolated, this is an important consideration. The trees and bushes presented a very prosperous appearance. The fruit is sold by tender as it grows, buyers to do the picking. Mr. Hill in this way once sold for Lord Coventry $\frac{3}{4}$ acre of plums and apples for 70*l.*, and he knew of a case in which $1\frac{3}{4}$ acres sold for 90*l.* Both sales took place some years ago. Lord Coventry is fortunate in not being troubled with the black currant mite, his immunity being due to the isolation of his orchards.

There are between 200 and 300 acres of fruit on the estate. In one young plantation near Croome Court corn was growing. A large acreage of fruit was passed in several parishes on the way back to Evesham by a cross-country route, including Wadborough, Defford, Eckington, and Bredon.

Fruit Growing and Preserving at Tiptree Heath.

Although Essex is not a great fruit county, the tables given on preceding pages show that the orchards have increased by nearly 1,000 acres since 1878, and the small fruit by about 1,300 acres since 1888. In that county, moreover, one of the most striking instances of a farmer becoming a successful fruit grower is to be found. In 1862 Mr. A. C. Wilkin, of Tiptree Heath, near Kelvedon, occupying the next farm to the late Mr. J. J. Mechi, came to the conclusion that wheat growing was not likely to pay, and therefore turned his attention to fruit growing. He began on a very small scale, planting only two acres of strawberries. The plants cost no less than 25*l.*, and were difficult to obtain even at that high price, as existing growers did not care to supply a new competitor. However, Mr. Wilkin increased his fruit area every year, and in 1885 he built his jam factory. In 1887 the business was transferred to a limited company, called the Britannia Fruit Preserving Company, with a share capital of 13,500*l.*, Mr. Wilkin owning more than

half the shares, and being made managing director. At present two of his sons are the only other directors, and a third son is secretary. Since that date the acreage of fruit has been doubled.

The Tiptree Heath farm is 250 acres in extent, and off-hand farms at Dagenham and Chadwell Heath bring the area up to 367 acres, 260 acres being under fruit, grown for the most part in rotation with corn and other farm crops. There are 165 acres of strawberries, 43 acres of raspberries, 30 acres of black currants, and small areas of red currants, gooseberries, plums, damsons, greengages, apples, quinces, blackberries, and cherries, some of the bush fruit being on the same ground as trees. The soil is a stiff loam over what Mr. Mechi used to call a "bird-lime" subsoil, and strawberries flourish upon it magnificently. The Small Scarlet strawberry, descended from the wild Alpine, is a speciality at Tiptree Heath, no less than 55 acres being devoted to it, as it makes the best of jam. The crop of this variety, seen on July 5, was the finest inspected anywhere during my wanderings through some of the principal fruit districts. There were two rows only on an eight-furrow stetch, this strawberry being of a spreading habit, and the plants stood up high above the ground, covered with the small and brightly coloured berries. Fair crops of Paxton and Royal Sovereign were also seen, the few Nobles grown having been gathered. Picking was in full swing, over 400 persons being employed, with a dozen gangers to superintend. The prices usually paid for picking are 1*d.* per 3 lb. or 4 lb. for the large varieties, and 1*d.* per 1 lb. for Small Scarlets. Men earn 4*s.* to 7*s.* a day at picking, and Mr. Wilkin has known a man to earn 10*s.* in a day. Women and girls are largely employed, as well as men. Women do not pick as much fruit in a day as men, but do the work more carefully. Mr. Wilkin sells fruit when it is dear, and he made 10*s.* a peck of his earliest Royal Sovereigns. Strawberries yield well when two years old, and stand for six or seven years on this farm.

Raspberries were not a good crop last season. The varieties are Superlative, Semper Fidelis, Carter's Prolific, and Norwich Wonder. The soil does not suit raspberries well; indeed, the only fruit grown to perfection is the strawberry. There was a fairly good crop of black currants, though the mite is troublesome, and infested parts of bushes are cut out and destroyed. Baldwin is chiefly grown, with some black Naples. The old Dutch red currant gave a very good crop. Crown Bob is considered the most generally useful gooseberry at Tiptree, though Lancashire Lad is good for bottling. Whinham's

Industry is a great cropper, but is described by Mr. Wilkin as a "big coarse sort."

With respect to the price of fruit, Mr. Wilkin remarked that in 1864 he sold strawberries at 18*l.* a ton for jam, and the same price was offered last season; but for choice fruit for the market he made a much higher price.

It was a struggle to make the jam factory pay for some years, and it would not pay now if the preserves, made as they are (excepting jam specified as "household") from whole fruit and sugar, were sold in the open market. But the company have special wholesale customers who deal in genuine whole-fruit preserves, and a large retail connection as well. No pulp is made, except when there is a glut of fruit, and then only for the "household jam," which is distinguished from the "whole fruit conserves," and sold at lower prices. Moreover, rapidly perishable fruit, such as strawberries and raspberries, is never held over for a day when intended for whole-fruit preserves. The picking of strawberries starts at 4 A.M., and the first lot is made into jam by 6 A.M. About 200 tons of jam are made in a year, including about half the fruit grown by the company, and some fruit purchased, amongst it apricots from California, Italy, France, and Spain. Marmalade also is produced in considerable quantity.

The factory is an excellent building, well ventilated and appointed, and kept scrupulously clean. There are eleven steam-jacketed vats to hold 70 lb. each, and two to hold half a ton of syrup each, which were in use at the time of my visit. The 70 lb. vats are not half filled in jam-making, only about 28 lb. being put into each, as the jam is better when made in somewhat small quantity. The syrup, simply sugar and water, after being boiled, is first placed in the vats, and the fruit is added afterwards. The heat is regulated by thermometers, and can be raised if desired to 225° F. Strawberries require to be boiled for only seven minutes, and very ripe fruit for only four, while gooseberries and some other kinds of fruit need more time. The scum is thrown away, and the scrapings of the vats are not allowed to go with the whole-fruit conserve. The jams and bottled fruit in the store-rooms presented a very attractive appearance. Everything in the factory, as on the farm, appears to be admirably managed.

There are a few other growers of fruit on a small scale at Tiptree, their aggregate fruit area being about 60 acres. Other Essex growers are two at Wickham Bishops, near Witham, one having about 100 acres and the other about 50 acres. At Brentwood and Hornchurch, again, there is a little

fruit, while more is produced around Ilford and onwards to Barking, and the Salvation Army farm at Hadleigh produces a considerable quantity. Yet another Essex fruit enterprise must be separately described.

The Elsenham Plantations and Jam Factory.

In 1889 Sir Walter Gilbey commenced to grow fruit on a small scale on his estate, Elsenham Hall, Essex, by way of example to his tenants, cottagers as well as farmers, and in 1893 he started a jam factory. To encourage the cottagers he has granted pieces of land close to their dwellings rent-free, and provided strawberry plants for those who required them, on condition that they send their fruit to the factory at market prices, and it is not surprising that a good many avail themselves of this advantage. Some of the cottagers also grow stone fruit. Sir Walter Gilbey now has about 25 acres under fruit. The top fruit consists chiefly of plums and damsons, with a few apples and pears. Gooseberries and currants are grown to some extent under the trees, and there are 5½ acres of strawberries and 5 acres of raspberries elsewhere. The plums are Rivers's Early Prolific, Czar, Victoria, Mirabelle, Curlew, and Monarch; the apples, Cox's Orange Pippin, Duchess of Oldenburg, and Ribstone Pippin; and the pears, Conference. Crown Bob and Whinham's Industry are the principal gooseberries, and there are some of the Lancashire Lad variety. The Stirling Castle and Paxton strawberries are the only kinds grown for jam. The manager of the fruit plantations considers the Hornet the best raspberry to grow, and it makes jam of a fine colour. The Superlative is the other variety cultivated. With respect to the plums, the manager said that the Victoria cropped every year, and he never got less than 100 bushels off half an acre.

The fruit plantations presented a flourishing appearance in the middle of July, a good crop of plums and a fair crop of one or two kinds of apples being noticed. Gooseberries had done well, and the raspberries were much more full of growth and better fruited than most that had been seen elsewhere. There was also a fair crop of strawberries. One plantation of apples consists of young trees grown in the nursery for pyramids, but now being trained as half-standards. They are only 9 ft. by 6 ft. apart, and will be too thick when fully grown, though they have no bottom fruit under them. Some plums are at the same distances, and the manager said that every other tree would have to be grubbed up. In another plantation the plums are 9 ft. by 9 ft., with gooseberries or currants under them. Some

gooseberries are grown without any top fruit. There are also a few cob nuts and filberts.

The jam factory is a convenient and well-appointed building, admirably managed by Mr. A. F. Barter. There are three steam-jacketed vats, and they turn out about 40 tons of best jam, 15 tons of pulp jam, and 10 tons of marmalade in the year. Jam is made quite in the home method, except that steam and thermometers are used. That is to say, fruit, excepting some of the strawberries, is simply boiled with the best loaf sugar. The only fruit boiled in syrup previously prepared is the strawberry for whole-fruit jam. Raspberries are boiled only six to seven minutes, but strawberries longer. The marmalade is made of Seville oranges exclusively.

In bottling gooseberries, the fruit is put into the bottles, which are then wired down, and placed in cold water, to be gradually heated by steam and kept at a temperature of 180° F. for about two hours.

As fruit appears to flourish at Elsenham, it was somewhat surprising to learn that Sir Walter Gilbey's farm tenants have not yet shown much disposition to become growers. In consequence of the demand for his jam having become greatly in excess of the supply, he contemplates a considerable increase of his fruit acreage.

Strawberry Growing in the Southampton District.

Hampshire is one of the few counties in which the area of small fruit exceeds that of orchards, the former being returned at 2,209 acres, and the latter at 1,986 acres. Moreover, the small fruit area increased from 746 acres in 1888 to the extent given above for 1898. This increase is in great part owing to the expansion of the strawberry fields of the Southampton district. As strawberries had been seen in many other districts, it was not deemed necessary to visit this one. Information, however, was obtained from persons acquainted with the district, who state that the strawberry industry is in the hands of a number of small growers, few of whom cultivate over 20 acres.

Mr. David Cowan, Director of Technical Education to the Hampshire County Council, informs me that about 7,000 tons of strawberries were sent from this district to London last year. Botley and Sarisbury are two of the parishes in which the fruit is extensively cultivated.

Mr. Thomas Spencer of Sarisbury, who is one of the largest growers, has obliged me with some information concerning his own district, extending to about 7,500 acres, not more than one

fifth of which, he thinks, is devoted to strawberries, while Botley and the other parishes in which the fruit is grown have together a smaller acreage of it than the Sarisbury district. The cultivation of strawberries has increased largely during the last five years, but is not likely, Mr. Spencer thinks, to be further expanded this season, as the last two years have been unfortunate to growers. Some have been fairly successful, he adds, while others have done little more than pay expenses. About five-sixths of the strawberry holdings are from $\frac{1}{2}$ acre to 5 acres in extent, a few from 5 to 10 acres, still fewer from 10 to 20 acres, and only four or five over 20 acres, with 35 acres as the maximum. For planting, runners from one-year plants only are used, as these are found more fruitful than runners from older plants. Planting is done at any time between August and the end of November, and during March. The principal manure used is London peat-moss manure from stables, though growers have lately tried artificials with good results. Shortly before the blooming period strawberries are bedded down with straw, about $1\frac{1}{4}$ ton per acre being used. Five years ago about 90 per cent. of the strawberries were Paxtons, and about 10 per cent. Nobles; but now Royal Sovereigns are superseding Nobles, and in some measure are taking the place of Paxtons. Picking usually begins in the district about ten days earlier than in Kent —in some seasons as early as June 1, but in others not before June 15. Nearly all the first week's gathering goes to London; but afterwards three-fourths of the strawberries are sent direct to the midlands, Scotland, and Ireland. The freight to London is a little over 2*s*. 3*d*. per cwt., that charge being made on eighteen baskets holding a gallon each, averaging $5\frac{1}{2}$ lb.

Commercial Fruit Growing in Devon and Cornwall.

Although Devon is the greatest orchard county in England, the extent of commercial fruit plantations, in comparison with that of cider orchards, is small. In South Devon, however, a considerable acreage of apples, pears, and plums is grown for local and outside markets. When at Plymouth I was informed by a market inspector that there were some large growers of the usual tree and of bush fruits, strawberries, and raspberries at Tamerton, Devon. Beer Alston is another Devon parish in which fruit is produced for market. Strawberries are grown extensively in the Exeter district.

The largest market garden in Cornwall belongs to Mr. Frank Craze, and a brief description of it may be interesting. It is at Polgrain, Lelant, a few miles from Penzance, and is 112 acres

in extent, about 30 acres being planted with fruit. Mr. Craze, who has another farm of 60 acres, and is a large grower of vegetables, began to plant fruit after purchasing the Polgrain farm twelve years ago. He has some excellent young plantations of apples and pears, and a few acres of plums. Cornwall, as he explained, is not a stone-fruit county. Trees of the three kinds are 12 ft. by 12 ft. apart, with strawberries under most of them, and gooseberries or black currants under some of the rest. Strawberries as bottom fruit or otherwise cover 25 acres. Some rhubarb and spring cabbages had been grown in one fruit plantation.

The apples are Lord Grosvenor, Lord Derby, Cox's Orange Pippin, Blenheim Orange, Celini Pippin, Bismarck, Golden Spire, Stirling Castle, Warner's King, Ecklinville Seedling, and Keswick. The pears consist of Hessel, Fertility, Pitmaston Duchess, William, Early Baking, Calebasse, Clapp's Favourite, Louise Bonne of Jersey, Marie Louise, and Doyenné du Comice. The plums are Rivers's Early Prolific, Victoria, Czar, Egg, Magnum Bonum, Black Diamond, Greengage, and Monarch. These are good market varieties of the fruit. The black currants are Carter's Champion and Baldwin; the strawberries, Paxton, Royal Sovereign, and Noble; and the raspberry, Superlative only.

Mr. Craze once grew 10 tons of Hessel pears on an acre, besides bottom fruit, and sold them at only 4*l.* a ton. In another season he grew only 4 tons, and sold the fruit at 16*l.* a ton. The smaller crop not only gave the higher returns, but was much less expensive to pick and market. Liverpool and Leicester are the chief markets for the produce of the market-garden farm, as Mr. Craze has brothers there who are salesmen. Unplanted land near the farm lets at 50*s.* to 60*s.* an acre. Wages are 2*s.* 6*d.* a day for men and 1*s.* for women. The management appears to be excellent.

Among other Cornwall parishes in which fruit is grown are Gulval, Saltash, and Stephen.

The Duke of Bedford's Experimental Fruit Farm.

No more interesting visit has been made in all my wanderings than one which was paid to the Experimental Fruit Farm at Ridgmont, near Woburn. It was established by the Duke of Bedford in June, 1894, with the valuable assistance of Mr. Spencer Pickering, F.R.S., who still acts as scientific director; while Mr. R. L. Castle is the highly capable superintendent of the practical work, carrying out the experiments

and recording their results. The farm is 20 acres in extent. The soil is a heavy one, over a clay subsoil, but apples do remarkably well on it, and plums fairly, while pears grow satisfactorily, though the soil is too cold to suit them thoroughly.

Mr. Castle kindly accompanied me to all parts of the little farm, pointing out and fully explaining the character of the numerous experiments. The first to be seen was a kind of object lesson, showing different plans of planting. There are three half-acres, representing respectively the method of planting suitable to (1) regular fruit growers, (2) farmers, (3) cottagers. On one half of No. 1 standard apples have been planted 30 ft. by 30 ft. apart, with dwarf apples, pears, and plums between them, gooseberries, currants, and strawberries as a bottom crop, and damsons, nuts, and raspberries round the outside of the quarter-acre. The cost was 76*l.* per acre for trees, bushes, and plants alone. Four years after planting the gross return was at the rate of 70*l.* an acre. On the other quarter-acre there are no strawberries but more bushes, and the return at present has not been more than half as much as that of the first quarter-acre. The cost was at the rate of 68*l.* per acre for trees and bushes; but the more expensive piece has hitherto been by far the more profitable. All the trees, as well as those on the farmers' and cottagers' plots, were three years from the budding when planted.

On the first quarter-acre of the farmers' plot standard apples were planted 30 ft. by 30 ft. apart, with dwarf pears and apples between them, and gooseberries between the trees in the rows, the spaces between the rows being reserved for culinary vegetables (potatoes, cabbages, beans, and peas). Plums were planted round the outside. The outlay was at the rate of 24*l.* per acre. The gross return four years after planting was at the rate of 16*l.* an acre. On the second quarter-acre standard apples were planted 30 ft. by 30 ft. apart, with dwarf apples, pears, and plums in the same rows, and three rows of dwarf trees, gooseberries, and black currants between the standard tree rows, the cost for trees and bushes being 36*l.* The gross return from this quarter-acre was only about half as much as from the other.

The first quarter-acre of the cottagers' plot was like the first of the farmers', except that the bush trees were nearer together. The cost was at the rate of 40*l.* an acre for trees and bushes. On the second quarter of an acre, the vegetables, instead of being grown between the rows of trees and bushes, had half the space to themselves, while the other half was devoted entirely to fruit trees and bushes. This second portion of the cottagers'

half-acre has done much better than the first, as the vegetables had more sun and air. It is desirable to point out that the cost of trees and bushes in all these cases is much higher than commercial growers estimate it. As to the expense of preparing the land, it was very heavy, because as the farm is an experimental one, it was deemed desirable to treat all the land alike in the first instance, and the whole of it was both trenched and forked. Therefore to give the total expenditure in relation to plots of fruit representing commercial growers', farmers', and cottagers' plantations would be misleading.

Other experiments must be described as briefly as possible. Bush apples one, two, three, and four years old respectively, were planted four years ago. Those one and two years old when planted have generally caught up the others in size; but the three-year-old trees have yielded most fruit so far. Mr. Castle thinks that trees get stunted in nurseries, and he says that maidens (one year old) cost only about half as much as three-year-old trees. But I venture to think that he will find that the two and three years' trees will fruit better for years to come than those which were maidens when planted, because shifting in the second or third year after budding disposes trees to the fruiting habit. Where there is plenty of room, it is a good plan to buy maiden trees, plant them out for a couple of years in nursery form, and then transplant them into their final quarters.

In surface manuring *versus* digging-in manure before planting, the former has won. In slight *versus* hard pruning the former has given the better results so far. The two apples which have cropped best on the farm hitherto are Stirling Castle and Lane's Prince Albert. Cox's Orange Pippins also have fruited well. Certainly these trees were loaded with fruit. Six Stirling Castles of bush form, only four years from the planting, when they were three years from the bud, bore 1 cwt. of good apples. Bramley's Seedlings, on the other hand, though of the same age, have had hardly any fruit upon them yet. Potts's Seedling, an early cooking variety, compact in growth, a great cropper, and bearing very large fruit, has also done remarkably well.

A very important experiment in pruning has been carried out with six of each of three varieties of apples of bush form—Cox's Orange Pippin, Bramley's Seedling, and Potts's Seedling—as follows:—(1) Cut back first year from the bud, and moderately pruned since. (2) Cut back first and second years, and moderately pruned since. (3) Cut back after planting and not pruned since. (4) Not cut back or pruned at all. The results, as seen in the case of Cox's Orange, which shows them

most distinctly, are these :—(1) Good growth, but very little fruit. (2) Much the same as No. 1. (3) By far the best in fruiting, size of branches, and fruit buds. (4) Straggling, and entirely undesirable. A trial of summer *versus* autumn pruning has not brought out any difference at present.

Perhaps the most important of all the experiments is one testing the effects of different soil treatment after planting. All the land was trenched and forked before planting, and all the trees (of several varieties) were three years old when planted. Four divisions were then made as follows :—(1) The land kept cultivated—dug and hoed. (2) The land allowed to become hard, weeds being merely scraped off. (3) The weeds allowed to grow unchecked. (4) Ordinary pasture grasses sown two months after the planting of the trees. The results at the end of the third season after planting are these :—(1) Trees well grown. (2) Trees look as well as in No. 1. (3) Dwarfed trees not more than one-eighth of the size of those in No. 1 or No. 2. (4) Trees no bigger than in No. 3, and foliage more sickly. A more striking illustration of the bad policy of planting fruit trees in grass land, or of laying the land down to grass just after planting, could not be desired. The trees in this trial are apples on the paradise stock. A corresponding trial with apples on the crab stock has given similar results, except that some varieties on grass, such as Cox's Orange and Lane's Prince Albert, have begun to recover after four years, as if the tree roots might have got below the soil exhausted by the grass roots.

Another experiment of great interest may be thus described : —(1) Trees, planted four years ago, and carefully treated, the land being well cultivated and manured annually since. (2) Trees neglected for two years, and then cut back closely, and well treated since. (3) Trees neglected to present time, and the land not cultivated or manured. The trees in No. 2 have almost caught up those in No. 1 in size, but will probably not fruit well nearly as soon; while those in No. 3 are not worth keeping, but are to be cut back closely, to see whether they will recover.

In a trial with pears on the quince and pear stocks respectively, planted three years ago when three years old, the latter have made by far the greater growth, but have not blossomed yet, whereas the former have blossomed freely. In a similar trial with apples on the crab and paradise respectively, not much difference has been shown at present, except in a few out of 120 varieties; but the trees are only two years from the bud.

Two rows of apples are to be seen, from one of which all blossoms were removed, while the trees in the other were allowed to fruit. No difference in growth is noticeable. Other trials resulting in no differences are those of high and low planting (bud or graft, 3 in. above or 3 in. below surface of soil); autumn, winter, and spring planting; and applications of artificial manures in certain cases, which space is not available to describe.

Fish guano has proved much more effectual as a dressing for gooseberries, black currants, and raspberries, than equivalent quantities of superphosphate, sulphate of potash, and sulphate of magnesia, mixed, and nitrate of soda applied separately; but in all cases the manured plots were superior to those which had no manure.

Numerous dressings have been tried for the black currant mite; but none have killed the pest without injuring the bushes.

In a bed of 90 varieties of strawberries the fruit decreased in size after the second year from planting, and the decrease has been continuous since. Royal Sovereign and Paxton have done best at Ridgmont, though British Queen has also flourished. Superlative has proved the best raspberry; Black Naples, the best black currant, and much less liable to mite than Baldwin; Whinham's Industry, the heaviest cropper among gooseberries; and Rivers's Early Prolific, the most fruitful of plums.

An excellent shelter fence of American crabs deserves notice, as the fruit makes delicious jam. It is now 12 ft. high, but is to be cut back to some extent.

The land of the experimental farm is kept admirably clean, and the management throughout appears to be excellent. Fruit growers all over the world have reason to thank the Duke of Bedford for founding and maintaining a trial farm, which has already taught many valuable lessons, and is certain to teach more in the future.

Various Fruit Districts.

As the tables of orchards and small fruit afford information as to the extent of fruit growing in other counties than those which were visited, there is less need than there was in the case of flowers to give details concerning those counties, and the information kindly supplied by many correspondents must be given in a condensed form, as my report is already a very long one.

Some fruit districts in Cheshire and Lancashire were visited

in collecting information for a report on "The Food Supply of Manchester" for this Journal (Vol. VIII., 1897, Part 2), in which it is shown that fruit is produced by a large number of small growers in the neighbourhood of that city. In the Preston district of Lancashire, too, fruit is somewhat extensively produced. Messrs. Dicksons, of Chester, extensive fruit-tree nurserymen, kindly obtained for me a report from Mr. Peter Hall, of Kingsley, in the Warrington district of the same county, which it is necessary to bring into a small compass. Mr. Hall has 26 acres of apples, pears, plums and bush fruit. Damsons are uncertain croppers in his district, which is 500 ft. above the sea level. Most kinds of apples grow well, and some trees in Mr. Hall's orchards are a hundred years old, one of which yielded over 10 cwt. of fruit in 1897. The principal varieties are, Ecklinville Seedling, Dumelow's Seedling, Lane's Prince Albert, Lord Grosvenor, Lord Suffield, Maltster, Grenadier, and Queen Caroline. The chief pears are Buerré d'Amanlis, Fertility, Hessel, and Marie Louise d'Uccle.

Northumberland and Durham, as the statistics relating to orchards and small fruit show (pp. 32 and 34), are small fruit-growing counties, and an inquiry from an authority at Newcastle-on-Tyne failed to elicit information as to any districts in which the industry is extensive. The same remarks apply to Cumberland, except that Messrs. Little & Ballantyne, of Carlisle, mention a few market gardens and many orchards around their city where they have very extensive nurseries. Certain districts, and notably that of Scotby, they add, are favourable to fruit culture in relation to soil and climate alike.

Within six miles of York, according to the City Accountant, considerable quantities of fruit are produced. Mr. Waide, of Leeds, mentions that hundreds of acres of strawberries, with bush fruit, are grown in the Garforth district, seven miles from the great centre of population. In the neighbourhood of Ripon, Thirsk, Selby, and Pontefract, too, tree and bush fruits are extensively cultivated.

Writing on the fruit supplies of Leicester, Messrs. Harrison & Sons, of that town, state that strawberries are grown in considerable quantity within a few miles of the town, viz., at Belgrave, Rothley, Syston, Barkley, Thurcaston, Sileby, Cossington, Barrow-on-Soar, and other villages within about seven miles, although a few places outside the county contribute a portion, such as Bisbrooke in Rutland, and Melbourne in Derbyshire. Another important class of fruits grown also in these districts is that of gooseberries, currants, and raspberries. Supplies of other kinds of fruit are mainly obtained from

Worcestershire, Herefordshire, the south of England, and foreign sources.

Birmingham, Mr. John Pope reports, is largely supplied with fruit from the Evesham and Pershore district, and elsewhere outside the county of Warwick, though strawberries are grown somewhat extensively around Kenilworth. The area of small fruit in the county is very limited, and the greater proportion of the orchards must be those of farmers who send only a minor part of their produce to market.

Although fruit is produced to a moderate extent in Nottinghamshire, and there are many small growers around Nottingham, that important centre, according to the Clerk of the Market, is mainly supplied from Kent, Cambridgeshire, and Worcestershire, helped by Cornwall, Devon, and Lincolnshire. But Nottinghamshire returns the compliment by sending a good deal of fruit to Lincoln market from Tuxford, Dunham, Collingham, and other parishes. In the districts of Southwell and Halam, as well as in several parishes nearer to Nottingham, I had occasion to inspect several orchards a few years ago; but some of them were not well managed. Market gardens in Lowdham, Gunthorpe, Baisford, Bulwell, and other parishes also produce fruit of various kinds.

With respect to Buckinghamshire, Mr. John Treadwell informs me that around Cheddington and Ivinghoe there are a good many plums, damsons, and cherries, while throughout the districts under the Chiltern Hills apples and walnuts are grown.

Referring to other parts of Norfolk than the neighbourhood of Wisbech, already noticed, Mr. Thomas Rose, of Norwich, states that the parish of Lakenham, part of Mr. E. S. Trafford's estate, is nearly all let to market gardeners, who grow fruit as well as vegetables and flowers. In other parishes near Norwich also there are many large growers. Again, at Filby and Belton there are extensive producers of raspberries and strawberries for the Yarmouth market; and at Wiggenhall, near Lynn, many other growers of fruit are to be found.

Suffolk is not at all an important fruit-producing county, and the growers are chiefly distributed around the towns. The other Eastern counties have been noticed, and the chief fruit districts of Surrey are in the metropolitan district.

In Sussex the fruit plantations are a good deal scattered. There are some at Henfield, near Horsham, and more in the western parts of the county, notably at Washington, near Steyning, where there is a splendid little tract of fruit land on the Greensand formation, whence considerable quantities of

produce are sent to Brighton and other markets. Again, in the south, near Worthing, though not in that town of hot-houses, fruit plantations are to be found. West Tarring, close to Worthing, is particularly interesting for its ancient fig gardens, supposed to have been originated by Thomas à Becket, who introduced the fig there from Italy. At Lancing and two or three other parishes in the same neighbourhood figs and other fruit are grown. The district, I believe, is the only one in England in which figs are grown extensively in the open air.

Turning towards the West of England and passing over Shropshire with the remark that, apart from the farmers' orchards and the market gardens near towns, fruit is not much in evidence, Somersetshire calls for some attention. In the neighbourhood of Bath, Mr. Thomas Kitley, of the Oldfield Nurseries in that city, informs me that fruit is produced to a quantity much in excess of local requirements. Strawberries, for which the Bath district has been famous for half a century, are produced chiefly at Lyncombe, Widcombe, and Batheaston, while apples, pears, plums, raspberries, and bush fruit are grown at the same and other places. Mr. Robert Brown, of Failand, near Bristol, who is himself a grower of the several kinds of top and bottom fruit, in addition to the usual farm orchard trees, has favoured me with a report on fruit growing in North Somerset, which I regret to be obliged to abridge. It relates mainly to cider orchards attached to all farms. It is interesting to learn that most of the small farmers within twelve miles of Bristol pay their rents from the sale of the produce of their orchards, gardens, and the butter, eggs, and poultry carried by them to market. Apart from the retail trade in fruit, salesmen buy the surplus of the cider and other common apples to send to the manufacturing towns, where it is said they are used for dyeing purposes as well as for eating. It appears, however, that they are largely utilised in making cheap jam, mixed with strawberries, raspberries, and other fruits, and sold under those names. Mr. Brown has a good deal to say about cider making, and the need of renovating the orchards for that purpose. Cherries, he adds, are grown at Clapton and elsewhere, and strawberries at Tickenham, both of which places are near Clifton.

Gloucestershire is one of the most important fruit counties not visited, and it was my desire to notice the great plantations of the Toddington Orchard Company, about 1,000 acres in extent, established by Lord Sudeley; but as the manager informed me that visitors are asked not to publish an account of what they see on the great fruit farm, it was obviously useless to

inspect it. With respect to other parts of the county, Messrs. Wheeler & Son, of Gloucester, have favoured me with some information. The tree fruit grown for market consists chiefly of apples and plums, both being produced in most of the vale districts on either side of the Severn. The trees on farms are mostly grown over grass, but in market gardens over bush fruit. All kinds of small fruit are cultivated more or less. Strawberries are grown in the open ground generally, but in some cases under fruit trees, while raspberries are produced only in market gardens.

Mr. John Watkins, of Hereford, a well-known fruit-grower, reports that the apple is the fruit principally grown in Herefordshire, the soil being best suited to that fruit. Plums, pears, and cherries are produced on a comparatively small scale, while the acreage under strawberries, raspberries, gooseberries, and currants, has greatly increased during the last ten years, at the beginning of which period they were very little cultivated for market. Apples are grown nearly all over the county, chiefly over grass, though of late many trees have been planted in arable land, with bush fruit under them. Among the best districts for them are the valleys of the Terne and Frome, Withington, Pyon, Marden, and Ross. Plums and small fruit are produced most extensively in the parishes of Withington, Asperton, Putley, Marden, and Pembridge. Strawberries and raspberries are chiefly to be found growing alone, though the former are sometimes grown for a few years in new plantations of fruit trees and bushes. Mr. C. W. Radcliffe Cooke, M.P., to whom I am indebted for the addresses of fruit-growers, states that strawberry-growing has been greatly extended in recent years. Mr. John Riley, of Putley Court, planted 32 acres of plums, apples, and damsons, with gooseberries, red and black currants and strawberries, as bottom-fruit, in 1880 and 1881; but the black-currants failed, and had to be replaced by gooseberries. In the adjoining parish of Munsley, there are about 25 acres of strawberries, and two of Mr. Riley's tenants in Putley are small growers of this and other kinds of fruit. In Stoke Edith there are 40 acres of strawberries. Raspberries are produced extensively by Mr. Smith, of Marden; and strawberries by Mr. Ellick, at Withington.

In Monmouthshire, apart from the farm orchards, in which cider apples prevail, fruit growing is rapidly increasing, according to Mr. W. J. Grant, lecturer on horticulture, as well as on agriculture and dairying, to the County Council. This increase is mainly due to the efforts of the Technical Education Committee. Orchards are being renovated, and fresh

plantations of top and bottom fruit are being made. Upon application the County Council sends an expert to inspect, advise, and report, in relation to the kinds of fruit most suitable to any district, Mr. Grant inspects cottage gardens, allotments, and orchards, gives advice when desired, and delivers lectures on fruit growing and other branches of horticulture in the villages. Instruction of similar character is also given in the Industrial Schools and the Reformatory, in connection with which some fruit is grown. A useful pamphlet on "Fruits for Monmouthshire," written by Mr. Grant, is circulated by the Technical Instruction Committee.

With respect to the few counties not represented by visits or reports from correspondents, readers will see from the tables given at the outset that they are not important fruit producers, except, in some cases, in relation to cider apples and pears for perry.

Wales, apart from farm orchards, grows comparatively little fruit. Mr. Grant, who has kindly answered my inquiries as to Glamorganshire and South Wales generally, as well as in relation to his own county, states that very little fruit is produced there, though more might be grown with advantage. Even in the neighbourhood of populous Cardiff the production is small, and the supplies are derived mainly from Herefordshire, Worcestershire, Gloucestershire, and more distant counties. Of course, market gardeners near the large towns, and notably near Swansea, grow some fruit; but the production is not extensive in any part of South Wales. In Mid Wales, again, the production is limited and scattered, and in North Wales it is smaller still, though Llanrwst, Denbighshire, is noted for its strawberries.

The unexpected length of this report on fruit grown in the open necessitates the postponement of the article on fruit grown under glass, and some concluding remarks upon fruit growing generally.

WILLIAM E. BEAR.

70 Onslow Gardens, Highgate, N.

HEDGES AND HEDGE-MAKING.

From all one can learn Hedges have always been more or less subject to neglect, and it is not surprising that they should be particularly so at a time when, with all care in matters of expenditure, the returns from farming are small in comparison with the outlay. There was never a period when economy was more necessary, and a saving in any direction, where it can reasonably be effected, has become imperative. As it is only in rare instances that any direct pecuniary return can be looked for from hedges, it is but natural that their preservation should be among the first of the many operations on the farm to be neglected. It is, however, doubtful economy, for a stick in time may save nine; and when once a weakness commences in a hedge it very soon increases until it becomes gap, and a gappy hedge no longer performs its first duty of being a fence. To produce a hedge which is a reliable fence is a matter of considerable expense, but once obtained it is not expensive, considering the responsibility placed on it, to maintain it. A reasonable quantity of fencing is as essential to the proper working of a farm as is the homestead itself. In respect to the necessary expenditure in the maintenance of hedges there is one point which tends to minimise the seriousness of the outlay in labour, and that is that the work may be performed at a time when there is little else of importance to be done on the farm, consequently good labourers may be kept in employ during periods of slackness, so that their services are secured at times when they are necessary and valuable. This feature alone should practically do away with the excuse for neglecting to keep hedges in a thriving and efficient manner.

It is not intended here to deal so much with ornamental fences as with those of practical utility to the farm. From the adaptability of the whitethorn (*Cratægus Oxyacantha*) to the formation of efficient fences in all but the stoniest and most exposed situations, chief attention will be bestowed upon it.

I.—THE FORMATION OF HEDGES.

Characters Desirable in a Plant for Hedging Purposes.

The suitability of a plant for the purpose of making a quick or living hedge so as to form a fence against cattle is determined by a number of features, the most important of which are that it should: (1) Produce a hedge in a reasonably short time; (2) be long-lived; (3) be capable of easy repair if neglected; (4) be

uniform in growth; (5) be easily kept within suitable bounds; (6) present as a hedge a compact front; (7) be strong enough to resist the efforts of animals to escape, in which it is greatly assisted by having thorns or other strong prickles; (8) be easily raised so that the expense of the young plants may be small; (9) be adapted to the soil on which it is planted; (10) be little injured by frost, even in seasons of exceptional severity; (11) afford shelter to animals from cold winds; (12) have a tendency to produce shoots near to the ground so that it will enclose small as well as large animals; (13) afford little harbourage for insects; (14) be little susceptible to fungal and other diseases; (15) not possess stoloniferous roots which are apt to grow out into the adjoining pastures or fields; (16) not be too readily eaten by animals, either in the branches or shoots by cattle, or in the stems by ground game; (17) when old permit the stump or stool to be kept small or near the surface so as to throw up young wood of suitable size to maintain a hedge.

Properties of Whitethorn.

No plant possesses so many of these desirable features as the whitethorn, in which all of them are well represented. Some years are required to produce a whitethorn hedge fit to hold back gadding cattle, as will be seen hereafter from the information kindly supplied by gentlemen responsible for some of the longest and best kept systems of hedges in the country, though ordinary fences may be obtained in far less time. A whitethorn hedge is long-lived, and properly tended will be vigorous at the end of a century. The hedge is easily kept within bounds, and presents a uniform and compact appearance; being armed with stout short thorns, animals do not readily eat any but the young shoots, and hesitate to force their way through. Except when it is very young, frost and winds do little injury, while the whitethorn tree may be seen thriving in the bleakest places, throwing out its white blossoms in profusion after the sharpest winters. It sheds its leaves in autumn, therefore it does not provide the protection in the winter that the beech, which retains a large portion of its leaves, affords; at the same time winter grazing is limited to comparatively a small extent of the pasture land. Moreover, a thick whitethorn hedge is sufficiently dense to break the force of the wind to a greater extent than might be supposed. As to the other features mentioned as being desirable, they are well represented, while the undesirable ones are wanting.

In short, it may be taken as a fairly accurate statement that whitethorn is the best hedge where good fences must be kept;

and the fact that it is practically the only plant used for fencing along the sides of the railways running from the extreme north of England to the south, passing through a great variety of soils, and existing in climates differing greatly in respect to rainfall, frost, and elevation, is perhaps as good evidence as could be desired of the wide adaptability it possesses. On exceedingly thin soils whitethorn may not find sufficient nutriment to grow vigorously; while at very high elevations it is difficult to establish, as the young plants are affected by bleak situations, though if protection is afforded during the early years so that it gets a thorough start, and the wood becomes hardened, it is very hardy. On very wet soils, it is true, it becomes liable to lichenous growths, but this can be avoided by drainage. Open ditches are preferable, as pipe drains are liable to be choked by rootlets. Occasionally open ditches are inconvenient, and under-drainage has to be resorted to. Where practicable the ditch should be placed on the upper side, so as to cut off the water.

Banks in conjunction with Hedges.

Considering the large number of hedges found on high raised banks it may seem somewhat arbitrary to say that high narrow banks should not be employed, but an inspection of hedges grown under these conditions proves the advantage of planting on the level, or at any rate on only slightly raised flat beds. Of course the bank has the advantage of forming part of the fence, and making a fence sooner than when a hedge is planted on the flat, but the permanency of a fence when raised at the expense which is inseparable from that of establishing a quick hedge must not be lost sight of. Those who plant sometimes look to immediate results rather than to lasting ones. The fences are the property of the landlord, and the tenant is responsible in most instances for their repair. One need only look at the fences one passes by to see how lightly the importance of good fences is regarded by both parties. In some districts much of the planting has been undertaken by the tenants, who have received more or less assistance from the landlord. As the tenant's interest ceases with his tenancy, it is not surprising, where conditions are not laid down, that he should plant in such a manner as will secure results within the shortest time. As the bank helps him, he naturally adopts it.

Where fencing is undertaken by the estate it is decidedly preferable to hold in chief regard the permanent features, therefore planting on the flat is most desirable. Such is the practice on the great railway systems, which may safely be regarded as the

estates on which the art of fencing is best understood and best carried out. In fact we owe a debt to the railway companies for the excellent object lesson they have set us throughout the length and breadth of the land, and I am much indebted to the kindness and courtesy of Mr. McDonald, of the Chief Engineer's Department of the Midland Railway, for the valuable details of the system of hedging carried out under his superintendence which are summarized on p. 91. No one could have travelled on that railway without noticing mile after mile, in whatever district he might be passing through, of closely contained, neat, rigid and effective hedges by which the track was protected. Those who travel must also notice that these hedges are planted on flat beds, and not on raised banks. Ditches are used only where necessary for drainage purposes, but shallow grips are maintained in some instances to keep the cattle from "breasting" the hedgings.

Ditches in conjunction with Hedges.

Ditches in conjunction with hedges add to the efficiency of fences, provided the hedges are placed in a proper position; they are also useful and in some cases necessary for drainage purposes. If, however, the hedge is badly placed, that is, too near the edge of the ditch, in course of time the earth falls away, leaving the roots bared, with the result that it is difficult to keep the bottom of the hedge compact. No matter what form a hedge is designed to keep, its usefulness, and the length of its life as a fence, depend on the density of the bottom growth. In fact, a big-topped hedge with weakness below is as much a mistake as a big-topped horse with uncertain legs; and as the value of the horse ultimately is regulated by his feet and legs, so is that of a hedge by its bottom. When the hedge is placed too near the edge of the ditch it is liable to suffer in the same way as one placed on a narrow raised bank, by the washing away of soil from the roots; and although the earth from time to time taken out of the bottom of the ditch when laid on them makes a partial remedy, it is not a complete one. Much of the mischief, however, is caused by making the sides of the ditch too vertical in the desire to save space, but the saving need not be great, as the hedge may be grown chiefly on the ditch side, getting the required thickness without spreading far into the field. These points are referred to subsequently when describing the method of making a hedge and a ditch; it is better to deal more fully first with the flat bed system, as there are many points in common, and when treating of the ditch attention can be chiefly directed to features to be avoided.

Midland Railway Hedges.

The various points to be observed in hedge-making are well indicated in the subjoined summary of the answers to my inquiries. Attention has been called to the Midland Railway Company's hedges, and the particulars of management given here cannot fail to be of interest.

Mr. McDonald prefers double rows planted in parallel lines, the lines 4 inches apart, and the plants 8 inches from one to the other in the rows. The planting is done so that one row breaks joint with the other. . . . . . There are about 190 plants to the chain. Three-year- . . . . old quicks are purchased, costing usually 11*s.* per thousand. Whitethorn is generally used. The cost of preparing the beds is about 2*s.* per chain, but varies with conditions. The cost of planting is 1*s.* per chain, and during the first few years the cleaning costs about 1*s.* per annum. The stout, five-rail, post and rail fences cost 2*s.* 3*d.* per yard. The quicks are cut back at planting, and are left untrimmed until they attain a height of from 6 feet to 8 feet, when they are layered. The cost of layering is about 3*s.* per chain. Live stakes are left every 2 feet; the layers are cut close to the ground and are wattled between the stakes at an angle of about 40°—laying them uphill if the ground is not level. The railway side is trimmed, the field side being left untrimmed. The trimming of the hedges, subsequently, is done late in summer or early in autumn, and costs 6*d.* per chain.

The Duke of Bedford's Fen Hedges.

A description of another method of raising hedges as carried out on the Duke of Bedford's fen estates was kindly supplied me through Mr. Brodie, of the Thorney offices. I have personal experience extending over many years of the excellent manner in which these hedges are managed. The drainage of the fens and the consequent fresh laying out of the roads and farms within comparatively recent years necessitated a large amount of fencing, while in the flat and somewhat bleak district shelter from the cold winds is highly advantageous. The fences are therefore to a great extent such as have been raised within the past forty years, and the work of planting has been continued up to the present. In the parish of Thorney, some 18,000 acres, there is not a weak piece of hedging, but mile after mile of dense, bushy, well-contained fences without a gap may be seen, bearing testimony to the excellence of the management.

The bed is dug and cleaned to a width of 4 feet 6 inches; 18 inches, forming the root bed, is dug to a depth of 2 feet, and the portions on the outside of this 1 foot deep. It is regarded as essential that the beds be prepared at least a month before planting; the latter is usually done in November, but may be continued up to March. Nothing but whitethorn is used, and all the plants are purchased. Single-row planting is preferred, the quicks being set 4 inches apart. In April, after planting, the quicks are cut back to a height of 3 inches above ground. At three years the hedges are

cut into the desired shape, and subsequently are kept in shape by annual trimming. In cases where the old hedges require cutting down, layering is preferred to merely cutting down to the ground. On grass land, post and rail fences, costing 25*s.* to 30*s.* per chain, or post and wire, with top-rail, costing 20*s.* per chain, are found most suitable. On arable land, post and wire fences, costing 15*s.* per chain, are employed.

Leicestershire Bullfinches.

The Leicestershire bullfinches are of world-wide repute, and have proved as effectual in holding back cattle as checking the career of any but the best mounted huntsmen. As big cattle are grazed on the Leicestershire pastures, and they lie in adjoining fields with a natural tendency to try to get together, strong fences are a necessity. Mr. John Harrison, of the well-known agricultural seed firm of Leicester, whose business associations make him well acquainted with the customs of the district, has kindly sent me the following account of the methods adopted. Many of these fences are very old, but they are maintained in a vigorous condition by the practices in vogue, and are well worth the attention of those whose fences have become overgrown or out of repair.

In this and adjoining counties, especially on the heavy soils where bullocks are grazed, strong, thick fences are required. To prepare for them the ditch is cut about three feet wide and two feet deep, raising a bank about a foot high. It is composed of the turf turned in green part downwards, covered with several inches of fine soil, obtained from the bottom of the newly-formed ditch. In this bank the quick or whitethorn is planted by cutting out the lines and placing each set about nine inches apart in two parallel rows, the same distance apart. The age of quick is generally two-years seedlings which have been transplanted in nursery rows and stood there two years longer; this process insures plenty of short fibrous roots near the surface, and stiffens the stems, from which the young growth is made when cut down to about three inches from the surface of the soil. They are then allowed to grow up six to eight feet high, which takes, in most cases, about five years to accomplish—ready for cutting and layering, commonly called laying. During the whole of this time the new fence is protected by a "post and rail" fence on one or both sides, according as the land adjoining is arable or not, as the young hedge must be protected from the cattle, and be allowed free and undisturbed growth.

The process of layering is done any time during the winter by cutting off the back row, or that on the land side, about three feet from the ground, selecting the strongest rods, trimming them and leaving them about two feet apart to act as stays, through which the full length of the front row is drawn down and interlaced to secure them from springing upwards, and causing them to remain in the position in which they are placed. The layers must be split a little more than half through, about nine inches from the ground, on the side opposite to the direction of laying, and be wattled in at an angle of about 30° from the ground. By selecting the best of these and turning the brush or thorny parts towards the land and away from the ditch, a very strong and well-bound fence can be secured, all superfluous thorn parts being cut away, to leave the whole mass even and regular. These

will produce fresh growth in both rows, and grow up between the layers and further strengthen the whole living mass. In the old fences when plants have died through old age or other cause, stakes of ash, thorn, elm, and any other available kind of timber (except willow or elder) may be used as stays, and in such cases the layers of old hedges sometimes being few in number, it is necessary to take great care not to cut away any that might be required, and to make up for such deficiency as occurs by inserting dead wattles. The ditches are then filled with the surplus cutting of thorn, which keeps the cattle out and helps to protect the young growth of the fence. The object of placing the brush or thorny extremities of the layers on the land side is to form a wall against the stock. The brush and wattle are bound carefully along the top, with a binder made by interlacing long strips of young hazelwood or brambles, from stake to stake.

Fences on the arable land, which are kept much smaller, are usually planted in single rows six inches apart, cut by a splasher twice a year, and are not often allowed to grow more than about four feet high. They are occasionally layered, and frequently have a small ditch cut on one side. On well-managed farms most hedges are splashed about the month of August, just before harvest, to keep them compact and bushy, after the manner of the railway companies, who have the best examples.

A perusal of the accounts given above will show that they describe three different methods of hedge-making. In the first the quicks are set in double lines, and after a few years' growth the hedge is laid. In the second a single row of quicks is planted, and the hedge is trained into shape by annually cutting it back into the required form, inducing a particularly dense growth of thorn, thus providing shelter for animals as well as acting as a fence; whereas the railway companies have as a first object the protection of their track from the incursion of animals, though from their well-trimmed shape the hedges would act as effective shelters from wind. In the third Mr. Harrison gives a description of the Leicestershire methods of planting on grass and on arable land, together with the treatment of older hedges, as carried out by farmers with so much success. All these possess features of value to the farm and estate.

Preparation of the Bed.

A highly important item in the formation of hedges lies in the preparation of the bed. Discarding, as out of date and not best suited to the formation of a permanent hedge, the highly-raised bank, and giving attention to those hedges formed on low flat beds, the method recommended in the account of the Thorney hedges of digging and cleaning a track about 4 feet 6 inches wide, of which 3 feet are dug to the depth of a foot, while the middle 18 inches are trenched to the depth of 2 feet, is adaptable to practically all soils and most situations, and need be little enlarged upon. The feature of cleaning is, however, one that should not be overlooked, as the future work of keeping

it free from weeds is greatly lightened thereby, and it is obviously more easy to clean the land when fallow than when cropped by the young hedge. One point in connection with the preparation of the soil is maintained by all hedge-makers, and that is that it is most essential that the land be worked and the bed prepared some time before planting, so that the soil may lie under the mellowing influence of the weather at least a month, and preferably longer. This work requires to be done in autumn, and if sufficiently long prepared planting may be proceeded with in November, for although there is practically no growth the soil settles nicely about the roots and the rootlets strike readily into it, at once finding sustenance when spring growth is made.

A striking instance of the advantage of trenching, even though no manure was dug in, came under my notice a few years since. About five chains in the middle of a hedge some twenty chains in length was not trenched, as the work was hindered by a long winter frost; the soil being a light loam on a gravel subsoil it was supposed that in all probability it would not make a great deal of difference. The hedge grew well until about the fifth year, when it showed signs of weakness, and after a time patches of a reddish-brown fungus appeared; the disease spread throughout the whole untrenched length, and in the course of two years utterly destroyed it. The stumps were taken out, the ground trenched and exposed, and fresh plants were put in. It is about ten years since it was replanted, and it is now in a healthy and thriving state. The other part, which was trenched in the first instance, never looked back, and is now a stout fence from which the protecting rails have been removed. This may be an exceptional case, but there is no doubt that the failing of the hedge predisposed it to disease; although before disease showed itself it looked like dying. Good hedges have been obtained from untrenched beds, but experience is strongly in favour of trenching. Rich soils, with free subsoils, are least likely to be benefited by trenching, as the plants grow more robustly on them than on poorer soils.

Planting on sites of old worn-out hedges is rarely attended with success unless the soil is moved or re-made. As fences are frequently placed on boundaries, and one may not remove a neighbour's landmark, fences must necessarily be placed on old sites sometimes. When the old hedgerow is stubbed or stumped up the earth requires to be laid on one side, and a wide, deep, new bed made from the adjoining soil, the earth from the old bed being put back to fill in the hole made. It is advisable to trench in dung with the new earth, as the old hedge having

cropped the land for a long period has exhausted a large amount of nourishment from the soil. There is no actual evidence that there is an accumulation of injurious matter from the old hedge, though it is usually presumed that there is; but experience shows it is necessary to remove the upper portion of the soil. If the new soil is obtained within reach of a spade-throw it will be sufficiently fresh, and it is not necessary to go to the further expense of carting from a distance. A quick hedge is a narrow belt of trees kept from spreading too widely and from attaining too great height, but a considerable amount of growth takes place annually, calling upon the land on which it stands for sustenance. For some years the roots remain within a limited space, and it is specially necessary to provide a supply of plant-food near. It has, therefore, been found desirable to trench in some long manure to supply food. Well-rotted manure yields its nourishment quickly, and it is better that it should be extended over a longer period, as too rapid a growth does not tend to the bushy development of the hedge. On thin and barren soils well-rotted turf or sod trenched in is very useful, increasing the depth of the bed, and supplying a constant amount of food for a lengthened period. I am not aware of any exact trials with artificial manures, though there seems no reason why they should not be of practical value, but highly concentrated and soluble nitrogenous manures, if applied liberally, would in all probability conduce to over-rapid growth for a time. If such are employed, only small quantities should be used. Phosphatic and potassic manures could do little harm, and might be highly beneficial.

The discovery of the effect of the nodular bacteria on leguminous plants throws light on the cause of furze or gorse thriving on soils deficient in nitrogen for the production of non-leguminous plants, and there seems no reason why the knowledge should not be turned to useful account on poor soils.

Raising Plants.

The young whitethorn plants or quicks are raised from the haws of the hawthorn, and it would be possible to obtain a hedge directly by planting the haws and allowing them to grow up: but there are many points against this, the chief of which are that longer time is required to obtain a hedge, consequently cleaning has to be persisted in for a longer time and protecting fences are required for a longer period, while the plants themselves do not grow so sturdily. It is far better to raise the plants in nurseries, allowing them to remain in the beds for two

years, after which to transplant them into lines to acquire a more bushy habit of growth, and to develop a good supply of fibrous rootlets near the surface. As the plants cost to purchase from 10*s*. to 25*s*. per thousand, it is often found convenient to grow them on the estate, though on large estates where great quantities are required the power to buy at wholesale prices, and the selection of good plants which such large customers are enabled to command, make it practically as profitable to buy as to raise; for, though the cost of raising a thousand plants need not amount to 10*s*., the advantage of choice from a large number and so securing uniformity is a matter of considerable importance. On less extensive estates, where a smaller quantity is used and the higher price has to be paid, there is such wide margin for profit that it is more economical to raise them. The haws or seeds are slow to germinate, in fact not until a year the following spring from the time of ripening. They should be gathered in October from robust, well-thorned bushes, preferably from bushes not too old nor too young. Several methods are adopted to prepare and preserve the seeds for planting, one of the most simple, and at the same time effective, being to dig a trench a foot deep, placing a layer of straw at the bottom, then to place a layer of haws six inches in depth, as if deeper they may heat and injure the vitality of the germ; these should be covered by another layer of straw, which in its turn should be covered with earth. After lying until a year the next February, when the skin will have left the seed clear, the contents of the trench should be sifted to separate the seeds, which should then be planted.

Another very good method is, after gathering, to spread the haws on a dry floor for five or six weeks, then to soak them in tubs of water, when the skin will be easily detached by rubbing through the hands with sand, after which they should be laid on an airy floor until quite dry. Then mix the seeds with an equal bulk of fine, dry, sandy mould, and place them against a southern wall, covering them with dry mould to the depth of four or five inches. It is advisable to turn them occasionally, and a year the following February to sift out the earth and plant them.

Occasionally nature's method of passing them through birds to take off the skin and fleshy parts is adopted, by feeding them to fowls kept in an enclosure. The droppings containing the seeds are collected, and set aside until a year the following spring, being occasionally turned to prevent heating. The seed together with the manure is sometimes sown, but this may tend to irregular distribution of seed; it is better to sift out

the seed, which, owing to the shortness of the fowl's dung, is not difficult, and to sow at the desired thickness, the manure being sprinkled on the land if it is thought to require it.

The land should be light, friable, well-drained, and not too rich, and though trenching is desirable, when making the bed it is well to keep the manure near the surface to induce the formation of rootlets there rather than at a lower depth, for such plants are easier to move, more readily strike again, and are of a more bushy habit of growth.

A perfectly fine and well-prepared seed bed is necessary. The seed is sometimes sown broadcast, but this adds to the difficulty of cleaning, and it is better to place it in drills from ten to sixteen inches apart.

In some cases the drill rows are scratched out with a hoe, and in others depressions are made by means of treading boards. When treading boards are used, a plank the length of the width of the bed and two feet to three feet wide to suit the width of rows is employed. On the under side narrow pieces of wood running the length of the plank are nailed at the distance apart at which the rows are required. The weight of the workman makes depressions slightly under three-quarters of an inch in depth, being prevented from sinking deeper by the plank. If a long bed is being planted, and the rows are required lengthwise, it is preferable to work with two such planks, the workman taking up one and placing it at the end of the other. The advantages claimed for this system are that the seed is placed in a firm seed-row, while the surface generally is left light. The workman kneels on the board and strains the seed along the drills, lightly covering it with earth. The surface subsequently should be kept light and free from weeds by hoeing.

When broadcasting is preferred, the land should be well and finely prepared, and then be divided into beds three and a half feet in width, with narrow paths between, to avoid the necessity of walking on the sown portions. Sow the seed evenly, if possible, so that the plants will come up about an inch apart; then pat the ground firmly with the back of a spade. Previously to seeding a small quantity of mould should have been raked on to the pathways, and this should now be raked back, so as to cover the seeds to the depth of an inch or an inch and a half.

When the plants sown broadcast are a year old the stronger ones should be drawn out, and after cutting the tap-root to promote the growth of bushy rootlets near the surface, and also shortening the tops to about two to three inches in length, planted again in rows a foot apart, and the plants four inches from each other in the rows. Where sown in drills, and clearing is

rendered easier than when they are sown broadcast, this first transplanting is often dispensed with. They may remain two years in the first lines, at the end of which they require to be taken up and planted in lines eighteen inches apart, and six inches from plant to plant in the rows, after having again shortened the tap-root, and cut the tops down to within four or five inches from the ground. This is best done in October or February. The plants can remain in the rows one or two years, in accordance with the growth made; usually it is better to leave them two years, when they are known as two years' transplanted seedlings. The value of the plant, though commonly regarded in accordance with the strength of the stem, is, for the practical purposes of planting, greatest as the rootlets are most developed, and best retained when lifted and in readiness to be planted to form the hedge, because without an ample supply of rootlets the establishing of the hedge is slow, particularly when planting is followed by a dry period.

Quick can be raised from cuttings from the roots, but although there may be a gain in time when in the land, the cost of getting is greater, while the root growth is much more irregular, and not so convenient to handle. The results obtained from seedlings are far preferable, and few hedgers of experience would use root-raised plants where seedlings were obtainable.

Planting.

Opinions differ as to the advantages of planting in single lines or in double rows, and as excellent hedges are obtained under either system it is not a matter of essential importance, the chief point being that with double rows greater variety in the systems of laying to strengthen or renovate are possible, and it is highly important to regard the features which affect the length of useful life of the hedge. Whichever is adopted, the number of plants per yard is about the same. I have a personal preference for planting in rows eight inches apart, and the plants placed eight inches apart in the rows, "breaking joint," so that there is practically a plant at each four inches in line; and find no special difficulty in the matter of cleaning, as the hoe can be used diagonally through the rows, and so round the plants during the time they are young or cannot smother the weed growth. This is not in accordance with the views of many hedgers, but when plants are placed four inches apart in single row, and the plants are half an inch in diameter, there is a space of only three inches from plant to plant, and it is difficult to work even so small a hoe as one with a two-inch

blade without cutting the bark. When rows are placed four inches apart, of course a hoe cannot be used with so much freedom. However, either is sufficiently good for ordinary purposes, therefore it is advisable to think rather of the length of life of the hedge than of the very near future. If a hedge planted in single row with plants four inches apart be examined after the hedge has attained maturity, it will be seen that many of the stems have attained mastery over those alongside, and have either killed them or rendered growth insignificant. Close planting tends to make plants draw upwards, and the spaces between the lateral shoots near the base are lengthened thereby. As many good authorities on hedging advocate different distances between the plants in accordance with the size of the plants at the time of planting, it is probable that thick planting is done rather with the view of securing an impenetrable fence in the early stages of growth than when it is matured. Personal experience is rather in favour of not too thick planting and the encouragement of lateral growths, but not to the extent of leaving the rods so far apart that if denuded of laterals the animals they are intended to keep within bounds would be able to force their way between. In districts where hares and rabbits are numerous close planting to prevent frequent bottom gaps is advantageous, though, as every gap is a source of weakness, it is very difficult to maintain perfect fences where there is much ground game. An advantage is obtained in respect of the damage done by ground game by the strength of the quicks when planted, as stronger quicks have better powers of resistance. Quicks which have stood in the lines for more than three years are apt to be too big; those an inch to an inch and a half in circumference are sufficiently strong for all ordinary purposes, while those larger are not so ready to establish themselves unless particularly well provided with root fibres; and though they may present a stronger appearance at first, do not seem to make relative progress, and the younger often become an efficient fence in less time.

When planting, so long as it comes within the range of a cabbage or a timber tree, it is important to place the roots in the ground in such a manner as will encourage growth. Over-deep planting is the source of many failures, and quicks are injured by being planted too deeply. Freedom should be allowed for the roots to spread, and the conditions most favourable are secured by opening a trench with a spade sufficiently wide and deep to contain the roots, after which the earth should be replaced, and trodden in sufficiently firmly to keep the plants in place. The nick should be cut with a spade guided by a

gardener's line. When planted, the quicks should be cut off to a uniform height, about two to three inches above ground, as the roots, having received a check, cannot supply sap to give vigour to the whole plant, and bushy growth is induced near the bottom. Planting is then complete, and subsequent work will consist of keeping clean the soil about the plants, and trimming to maintain bottom growth; although, in most instances, it is necessary to protect the young hedge from cattle or other animals that may be grazing alongside.

Fig. 1 shows a usual form of laying out and planting on a flat bed. It is important to leave sufficient room between the fence and the hedge for the workman to work freely. It is very common to see instances where the space is so cramped that it is almost impossible to clean properly. The small grips or ditches at the side are not absolutely necessary, but they add greatly to the efficiency of the rail fence, and in course of years

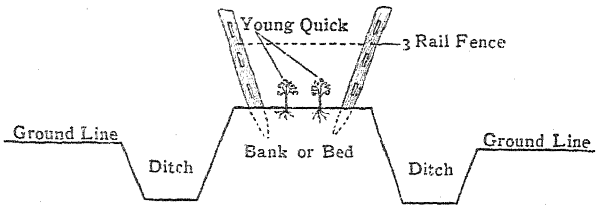


FIG. 1.—Section of Young Quick-set Fence.

gradually fill in; they are effective because animals cannot "breast" the hedge, that is they cannot apply their weight to it as their feet, being lower than under ordinary circumstances, have a downward thrust, and cannot be brought to bear in a forward direction. The grips should be placed sufficiently near to the fence to prevent bullocks from placing their feet on the bank, thus being able to apply their weight. All hedges are strengthened by such grips, though on arable land where no stock is kept they are of course unnecessary. A three-rail fence is sufficient for sheep and cattle; but where cattle only are to be restrained two rails are enough. Where larch poles are convenient mortising is not necessary, as they may be nailed on to the post; of course nailing them on the outside, otherwise all the strain has to be sustained by the nails, no help being afforded by the posts.

After long periods of dry weather, when ditches have contained little water for a number of years, there is a tendency to fill them in, as they do not seem worth the space they occupy. A return to wet seasons, however, shows that a mistake

has been made, consequently their value beyond their usefulness as fences is learned when only too late. The filling-in of ditches and the planting of hedges on their sites should therefore be done cautiously. Open ditches are the best drains, provided they are kept well cleaned out, but unless they are required for drainage purposes they should not be made in conjunction with hedges; the shallow grips already described supply all needs. Those who simply cut their hedges down to the stump, so that there is practically no hedge left for two or three years, instead of laying them, may place special value on them as means of fencing, but they are not otherwise worth the expense of maintenance. Where they are required because of the weakness of the hedge it is generally due to the fact that the hedge became weak because of their presence. A hedge and ditch may be worked together in such a way as not to tend to the weakening of the hedge, but planting too near to the edge of the ditch is a frequent and fatal error. Too great weight of earth thrown out of ditches when laid near to the edge tends to make the sides give way, consequently it is better to throw the earth some distance back, so that it shelves back towards the field, a table being left for planting near the ditch. The angle of repose varies of course with the nature of the soil, but it is noticeable that the sides are in almost all instances too nearly vertical. Instead of making a horizontal table the surface may be made to incline gradually, the slight incline not acting injuriously to the hedge. This is useful where cattle are to be kept on both sides of the hedge, as a shallow grip may be placed on the field side. When planting the quicks they should be placed well away from the ditch. The object of saving ground by planting close to the ditch is not of importance, as the hedge may be induced to grow chiefly towards the ditch side.

Protection and Shelter for Young Hedges.

In some districts, particularly in Ireland, which is notorious for its ill-kept hedges, the planting is done actually on the shelving side of the bank, so that in course of time, unless special care is bestowed upon it, the roots become denuded, and weeds grow in among them, tending to the early decay of the fence. The only excusable feature is that some shelter against wind is afforded to the young quick. The practice, however, is not followed merely in exposed situations. It is better to provide independent shelter if it is required, but this is only rarely needed, protection against animals being in almost all cases sufficient. A sod bank at the side of the

prevailing winds may be raised as cheaply as the ordinary bank, and will guard the young plants until such time as they have got sufficient strength to resist atmospheric influences. It is not necessary to build a high bank, and if it is required for retaining animals a single rail fence may be placed on it; by the time the rail fence decays the hedge will be able to take care of itself. A dead hedge of wattled wood provides good shelter, and where it is available is a cheap form of temporary fence and shelter. In stone districts a wall may be made for sheltering a young hedge, but with plenty of stone available an efficient permanent fence may be made, possessing in point of shelter from cold, economy of space, and permanency, advantages not obtainable from hedges.

In respect to the cost of post and rail fences for protecting young hedges, the prices already mentioned in the description of the Midland Railway Company and of the Thorney Estate experience afford good illustration in cases where sound work is at command. Lighter and less expensive pole fences may be put up at smaller cost, depending generally on the convenience for the supply of larch poles; though owing to the depression in hop-growing, ash and chestnut, which are suitable for the purpose, may be bought at a small cost. For bullock-fencing barbed wire is very effective and cheap, as a top strand of barbed wire prevents the animals from breasting the fence, and few supports are necessary as compared with other forms of fencing, and where wood is scarce it is frequently used. Great inconvenience and danger are caused by wire in a hunting country, but hunts generally now make terms with farmers by which the trouble is overcome.

Cleaning Young Hedges.

The prosperity of a hedge when once planted depends very much on the thoroughness with which weeds are kept down. Very sturdy hedges, and those where the grass is cropped closely to them, may smother out weed growths for even a long time; but a young hedge is much at the mercy of the weeds if they are allowed to grow unrestrained. During early years a strong Dutch hoe may be used with great advantage on the freshly dug bed; subsequently the fork is of more benefit, the light stirring about the stems a spit or two wide encouraging the root growth; when the hedge is older, and the rootlets have gone further afield for their nourishment, shallow digging with a spade is more expeditious. After this an inspection will show what is the best mode to adopt, and provided the bottom is very

dense, so that weed growth is smothered, nothing more than an occasional brush with a fagging-hook may be necessary. Brushing out should be done early enough in the season, as not only is it more beneficial for the hedge, but insects and injurious fungi are thus deprived of harbourage.

Training Hedges.

The systems of management before alluded to as carried out on the Thorney Estate and on the Midland Railway deal with two widely different but excellent methods of training a young hedge; they are representative of the two main systems, the first, of training a hedge into shape without laying, and the second, of laying a hedge into shape. It is a very general practice to cut back the growth after two or three years, leaving only three or four inches of stump, subsequently training into shape; on the Thorney Estate, however, the hedges receive the best attention from the first, and lateral bottom growth is encouraged, so that it is possible to commence shaping at three years at a height of eighteen inches. The closeness of the cutting is regulated by the nature of the growth, and an extraordinary denseness is obtained. The illustration (fig. 2) represents the best shape into which a hedge may be trained.

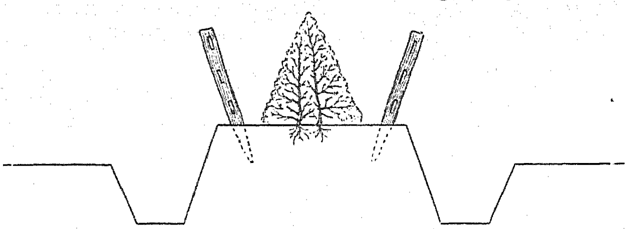


Fig. 2.—Section of Quick-set Hedge, to show triangular shape.

For general purposes the triangular hog-maned hedge, with broad base, is best. Where a high, narrow hedge is required, more particularly as a shield from wind, as around an orchard, straight vertical sides may be more suitable, but where a hedge is required as a fence against cattle, the triangular form is undoubtedly best. The chief reasons for this are that whitethorn shoots are seriously affected by the shade of portions above them, and from the wet dripping on to them; also because the value of a fence for enclosing animals of all sizes depends rather on the density of the bottom than on the height—a hedge weak at the bottom rapidly weakens; also because a large quantity of lateral shoots attract sap, and thus prevent excessive flow to the upper shoots, to which there is great tendency.

The Midland Railway Company's method is one of making a hedge to shape rather than growing it to shape. In the first instance, the hedge is allowed to grow to the height of six or eight feet, and is then wattled at an angle of about forty degrees, stakes being left at about two feet apart, the wattling rods being hacked close to the ground, and woven in between the living stakes. From observation, I am able to speak of the regularity of the wattling and its rigidity. The hacking of the stem causes a strong growth of young shoots at the base, which go to form the bottom of the hedge, and the upward flow of the sap is arrested sufficiently to prevent over-growth at the top, while allowing sufficient to go up to maintain it in a healthy state. The wattling makes the hedge practically impassable to animals. In course of time the hedge assumes under the plashing-bill the triangular shape, but with a somewhat narrow base.

Any other methods in practice which are worthy of adoption are merely adaptations of the foregoing with slight modifications. All good methods are comprised in those which tend to the encouragement of bottom growth. Addition to the height can always be secured in a short time if desired.

The trimming of whitethorn hedges is best effected by the plashing or splashing bill, used with an upward stroke. The shears are tedious, and do not give a better face than the bill in the hands of a capable workman. A word of praise is, however, due to the Ridgway machine clipper, which is expeditious, and, under certain conditions, economical where an extensive system of hedges has to be kept in form.

The season for clipping a hedge, fortunately, is an extended one, for it is work which may be done at any time that labour can be spared for it. As a rule, it is well to do it when the sap is down, and that is during the period when other work on the farm is quiet. Some who take great care of their hedges trim between haytime and harvest, and again during winter. By some, summer clipping is objected to, as they urge that the cutting of the wood whilst the sap is full is detrimental to the vigour of the hedge, but it would, I think, be found difficult to prove direct injury. When hedges are really strongly established and vigorous, it is not altogether unfavourable for them to be retarded slightly in their growth, as it keeps them from running to too great top growth, to the benefit of the bottom growth. Trimming is a form of pruning, and frequent pruning tends to the formation of a greater number of branching shoots, causing the face of the hedge to present a denser front. The work on well-established hedges is most quickly performed by a long-handled splashing-bill, though on a small hedge a short fagging-

hook may be used with advantage. The old maxim that a hedge should be trimmed whenever the knife is sharp enough indicates the advantage of trimming, and the little need to regard the season at which it is done; but a point in favour of summer trimming is that it ensures the destruction of weed growths, and therefore the encouragement of the bottom growth of the hedge, also that where live stock—particularly sheep—are kept, it is of advantage to cut during summer while the thorns are soft, as there is less chance of the animals being pricked and lamed. Most other features tend towards autumn and winter trimming.

II.—THE PRESERVATION AND RESTORATION OF OLD HEDGES.

The Preservation of Established Hedges.

The preservation of established hedges is of equal importance with their construction. That they very frequently receive insufficient attention is shown by the fact that there are so many hedges which through gappiness are not fences. Neglected fences take many forms; they may be roughly grown hedges which for the shelter of animals have been allowed to attain to the height of twenty feet; or they may be not more than three feet in height, which have been trimmed on the top, but through neglect about the roots have taken the form of a series of gaps below. Between these extremes there is practically an endless variation, and it is impossible here to deal with all separately, but this, again, is not necessary, as general principles apply to all, and the details can be carried out in accordance with the individual case as it presents itself.

A common method, and generally a bad one—for the hedge is not a fence for some years after—is to cut down the hedge to the stump or stool, to allow the young wood to grow to a hedge; it possesses the advantages of not requiring much skill to effect it. If, however, there are very coarse high stools it is sometimes beneficial to level off the old stumps to make them throw up an entirely new growth which may subsequently be laid. Big old stumps are unsightly, and tend to make the newly laid hedge become gappy; they, of course, originate from bad cutting on previous occasions, and point to the necessity of lower cutting. When hedges are planted on high narrow banks the falling away of the soil bares the stump, making it protrude, and is one of the chief objections to this system of planting. Whatever the system of renovating, the earth requires to be well laid up to the stems. Cutting down to the stool is practised in some few districts, at a long distance from coal-fields, as a source of fuel.

Pollard trees and hedges before the advent of railways were very important sources of fuel, and a broad hedgerow was a sort of narrow plantation; such hedgerows are met with in the more southerly counties, where they are largely relied upon for fuel; and it is significant that the hedges in those counties are irregularly and inefficiently kept, the weakness of the fences being encouraged by using dead wood when living wood is at hand. Considering the amount of land they occupy, the harbourage they afford for insects, the nurseries they are for fungal diseases through the supply of weed hosts, and how they tend to the foulness of the land through the seeds of weeds spreading from them, the advantage of the fuel can scarcely be sufficient to warrant their maintenance in the place of more effective but less extensive narrow quicks; particularly as so much woodland, capable of supplying the wood for fuel, which the custom of the country regards as necessary, exists where the wide hedgerows are still in vogue. Mr. J. F. Beddall, whose early years were spent in Essex, writes me on this point:—

In Essex and some other counties, as you know, the hedges are chiefly on banks, and are dealt with in a rather primitive manner. They are left to grow up roughly for eight or nine years, then cut off close to the bank, leaving live stakes from eighteen inches to two feet in height at intervals of eighteen inches, between which a layer of bushes can be placed. This is sufficient to prevent sheep and other stock straying until the hedge grows again. The ditch is "done out" at the same time. This is, of course, on arable land. I do not think a man could be found in Essex who could lay a fence as we understand it here (in Bedfordshire).

A Scotch Method of Trimming.

Mention has been made of the hedges on the Duke of Bedford's estates, and Mr. C. P. Hall, the agent on the Woburn property, has taken special pains to introduce good new methods, one of which was illustrated by a Scotch workman, and attracted much attention from the manner of working, and the severity of the cutting, though the effect on the fence has proved to be highly satisfactory. It was a practice with which I was unacquainted, and is probably not known to many, therefore a detailed description may be interesting. The workman uses a short-handled bill which he uses with a peculiar circular sweep. Slightly stooping, he makes an upward sweep with the bill in his right hand, cutting the wood with a long, vertical bevel; when the stroke is made as far as his right hand will reach, which will be over his left shoulder, the left hand seizes the bill, and passes it down behind him, when the right hand meets it, again taking possession of it, bringing it in front again, commencing another upward stroke. The bill thus

makes a continuous sweep or circle, up before him, and down behind him. This is done with great rapidity by a skilled workman: the circular sweep seems to have the effect of giving special impetus to the stroke; in fact, it easily cut through rods two inches in diameter. The long bevel necessitates a body movement, which is thus well obtained. The hedge when cut presents the appearance of a number of sharp-pointed rods, rising gradually from outside so as to form a ridge or hog-mane. From these there is an abundance of lateral shoots given off. The long bevel acts beneficially by preventing too free a circulation of sap in the upper part, consequently the sap goes to produce bottom growth. When a rod is cut nearly horizontally across, the sap flows unrestrained to the top, and a vigorous growth takes place there to the detriment of the lower part. When hedges are intended for ornamental purposes, the beauty is much destroyed by unsightly gnarled growths at the point where the growing rods are cut off. To obviate this, when layering hedges, dead stakes are frequently used, but if growing stakes are employed, excessive growth at the top may be prevented by hacking them nearly through at the base, so that bottom growth is induced, and the upward flow of sap hindered. By making a long bevel the flow is gradually checked, and bushiness at the top is obviated. The treatment as practised appears severe, and in the first instance, where tried in Bedfordshire, the tenant asked Mr. Hall—perhaps not altogether without some humour—if he would not find him posts and rails to protect the hedge; however, in the course of a year it had grown so well that it was a capital fence, and showed remarkable vigour. There is no doubt that the principle of the long bevel might be used with great advantage in most systems of live hedge renovation.

Cutting Back to the Stem.

Another practice is that of cutting back, or ribbing, which consists in cutting the brushwood or side-shoots of overgrown hedges back to the middle, leaving a more or less bared framework for the new shoots to spring from. This is suitable where the hedges are not gappy, and is applicable where, after a long period of trimming, the hedge shows signs of decay in the middle, through dense growth on the outside, which has smothered the inside; for a hedge too wide and thick always suffers at the heart from want of light and air. The process is usually a simple one (figs. 3 and 4), but the ultimate shape should be kept in view. Cutting back, however, is not so conducive to

thick bottom growth as where the stems are hacked at the base as when layering, so as to arrest the upward flow of sap, and allow it to be utilised freely by the lower shoots. However, by leaving a good growth at the base, sap is attracted, so that with

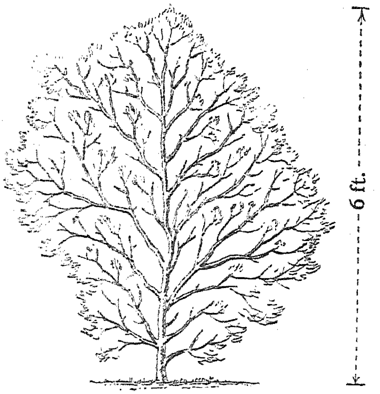


FIG. 3.—Section through over-spreading hedge.

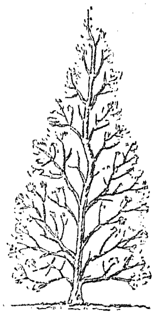


FIG. 4.—Section through over-spreading hedge (fig. 3), cut to hog-mane shape.

the light and air good growth is secured there. Where there are double lines, one row may be cut down to the stump, leaving the other as a fence and blind (figs. 5 and 6) until the first row grows up, a dense bottom growth being obtained. In course of

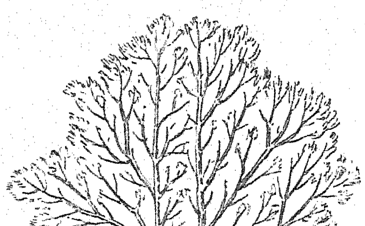


FIG. 5.—Section through over-spreading double-planted hedge.

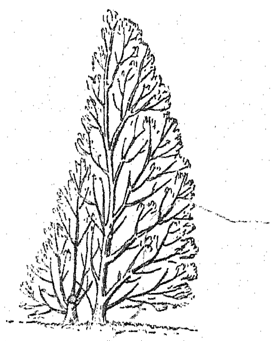


FIG. 6.—Section through an over-spreading double-planted hedge (fig. 5), two years after one side was cut down to stump, and the other side trimmed in slightly.

years, when the younger side has grown up, the older may be cut down, in which way vigorous young wood is obtained at all times; this is of course an inexpensive method of hedging, but is not applicable where the hedge has become gappy.

Layering or Laying Hedges.

When the hedge is tall and roughly grown, having been left untrimmed for a number of years, laying is the best method of treatment, the long rods being suitable for wattling. In dealing with such a hedge a very important feature is the selection of the wood best suited for the purpose of wattling. In the first place all decaying stumps should be cut off level with the ground, and rods for wattling and stakes chosen from the most vigorous stools. Young rods throw out the most frequent shoots. Honeysuckle, briars and clematis are among the worst enemies to hedges, as they smother the growth of the quick. Barberry, from its acting as a host to the fungus causing mildew in wheat, should be taken out. Elder is another of the greatest enemies to hedges, its straggling growth making them unsightly, and as it spreads rapidly it soon occupies a considerable space, which quickly becomes gappy. Where elder plants are common the seeds are carried to the hedgerows by birds, so that they frequently establish themselves.

When the wood is of varying thickness, and the hedges gappy, it is advisable, from time to time, to stand back a few yards from the hedge so as to determine which wood should be used and which discarded. It is often necessary to trim down the brush to make an opening so as to give freedom in working. Where the wood is of equal thickness, of small growth, and there are no gaps to fill in, it is only needful to cut out what is unnecessary; but otherwise a good deal of the success in making the new hedge depends on the preparation of the wood before laying. The bank or bed should be cleaned before the wood is brought down, as it is most convenient to do it then.

Wherever practicable the wood should be cut with an upward stroke, as the cut surface is then smooth, so that water runs off easily, and little decay takes place; but when cut with a downward stroke there is vibration, which causes the wood to splinter, so that rain and frost, together with almost constant dampness, cause considerable decay. An inspection of a hedge which has been cut with the down stroke always reveals in course of time the injury thus brought about, and it is one of the chief causes of gappiness in old hedges. When the wood is thin, a single stroke, as shown at C (fig. 7), is sufficient. It is important to cut it so far through that it may be bent without splintering; the angle at which wood is to be laid in the wattle regulates the extent of the stroke, for the lower it is laid the further through is it necessary to cut. Where the wood is

thicker, as at A (fig. 7), an upward cut should be taken, after which a downward cut may be made without splintering, a chip being taken out, so that the rod may be laid down as at B (fig. 7). So long as there is only a small amount of wood adhering to the bark the sap will flow to the upper part, and it is often advisable to cut out a long slice of wood as shown at D (fig. 7).

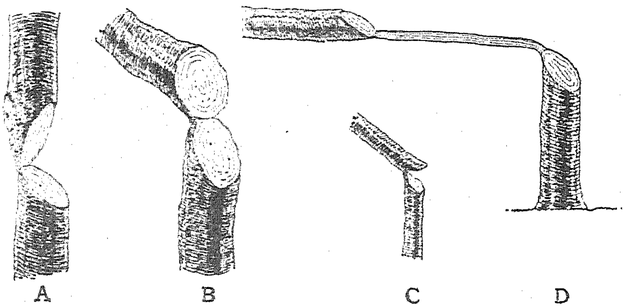


FIG. 7.—Methods of cutting growing rods for laying.

The quantity of wood left in for laying depends on the nature of the animals against which it is designed to fence; and the height of the fence of course regulates the height at which the stakes are left. There is one most important point to bear in mind when renovating live hedges, and that is that the object is to

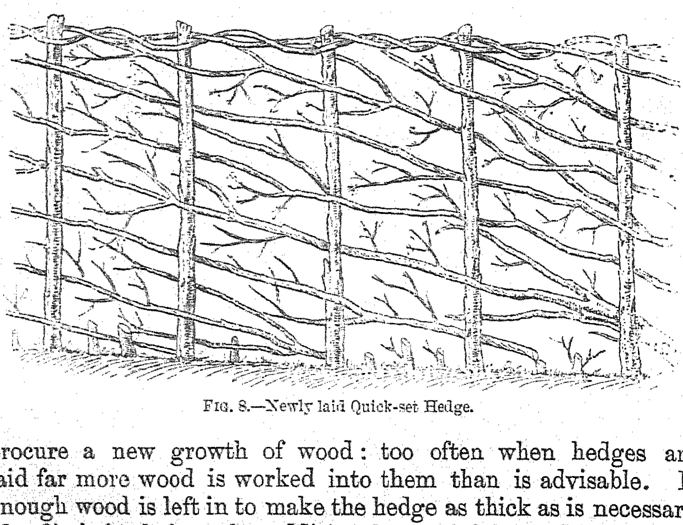


FIG. 8.—Newly laid Quick-set Hedge.

procure a new growth of wood: too often when hedges are laid far more wood is worked into them than is advisable. If enough wood is left in to make the hedge as thick as is necessary (fig. 8), it is obvious that additional growth is superfluous. Not only is it superfluous, but the hedge suffers because the young

wood growing up smothers that in the middle, and in course of time the heart of the hedge decays, causing weakness to the whole fence, bringing about its untimely destruction, or rendering it necessary to do the work again within the course of a very few years. The object, therefore, should be to reconstruct the hedge so that it may grow into a fence. Comparatively few wattles of young vigorous wood are sufficient to form a barrier; and the young shoots of one year's growth make a blind which prevents animals from attempting to break through. Whether a hedge is laid or cut back this holds equally good. Nor should this point be lost sight of when filling in gaps; too often a large quantity of dead wood is laid in, with the result that new wood does not grow in. A small piece of post and rail fence, sufficiently durable to last until the gap is grown in, should always be used in preference.

It is usual to fence from 4 feet to 4 feet 6 inches against cattle, and 3 feet to 3 feet 6 inches against sheep and pigs, but deer require 6 feet to 6 feet 6 inches. Hares and rabbits may be kept back by fencing 3 feet high, but they prefer going through instead of over, and without wire netting it is practically impossible to make a live hedge which will not show some weak spot through which they find their way.

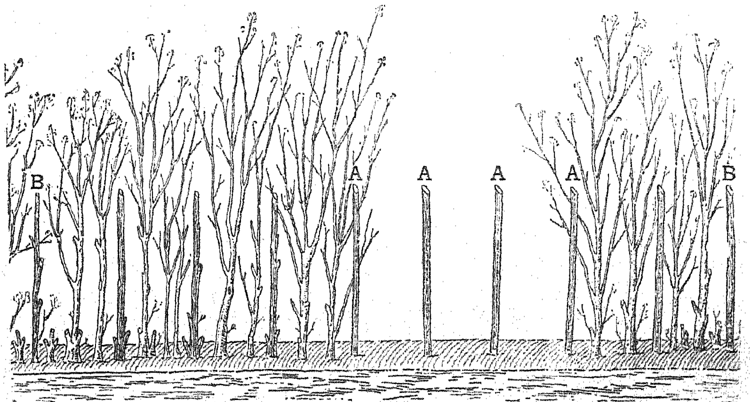


FIG. 9.—Hedge thinned for laying, and prepared for stopping gap. A, deadwood stakes. B, live wood stakes.

The illustrations, figs. 9 and 10, show the mode of preparing and laying a hedge, a portion of the brush being cut off to show the method of wattling; at the same time the filling in of a gap is illustrated. When the earth is laid up and the rods prepared, they should be well interwoven. Young strong stakes should

be chosen, or in the event of there being gaps dead stakes must be provided; these can often be cut out of the wood taken from the hedge. The wattling should preferably be done so that the brush is placed on the side opposite to that on which the man works; a straight side may thus be kept, provided the stakes are set straight: the workman sees better the thickness at which he is working when on the side opposite to the brush, and operates more freely. After the brush is laid it is necessary to put on a header or binder, which consists of a number of thin rods interwoven about the stakes, thus preventing the brush from springing up, or from being lifted from between the stakes by cattle. In the case of live hedges it is not necessary that this be very stout, as in a year or two it is not needed. The binder is put on in the opposite direction to the wattling—that is, the thick ends are placed in the opposite direction.

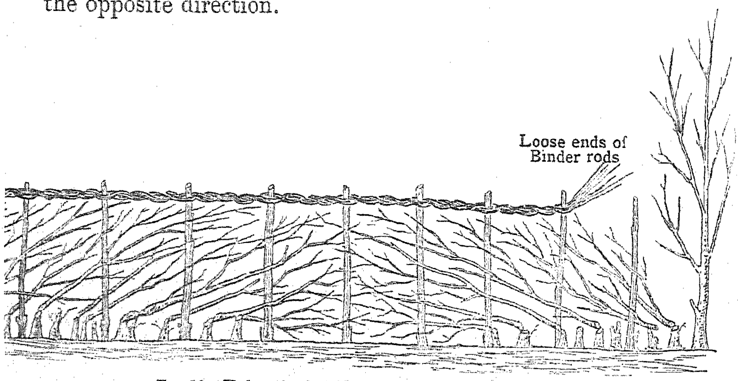


FIG. 10.—Hedge (fig. 9) laid, and gap filled in with living wood.

When the laying is completed, the after management of the hedge should be directed to keeping it in shape. If a hedge is well laid it may be kept in shape for twenty or even forty years by judicious thinning, and by keeping the ground clean at the base. Often, however, when once the hedge is laid nothing further is done, but it is allowed to grow up for a number of years to become a straggling fence again, and has to undergo re-laying. As a rule, although the practice is a common one, high-class hedges are not obtained in this way; moreover, the big hedge growth conduces to corresponding root growth, which causes the roots to run far afield for nourishment. The object is usually either to secure wood for other purposes, or to provide shelter for the animals. Hedges are of very considerable value as shelters, but there can

be little doubt that it is more advantageous to put up an inexpensive field shelter where the animals can find dry lair, and be sheltered from rain and excessive sun heat. When this is done the manure accumulates so that it can be applied about the pasture instead of being chiefly deposited under the hedges, where it only feeds the hedges or produces rank herbage, which is not eaten but trodden underfoot. A fence as high as a bullock will break the wind, and a thick, well-kept one is more effectual than one which has become weak at the bottom, so that the wind draws through, even though there may be growth several feet high. Hedges thus allowed to run away are more expensive to renovate, and generally big stumps form which are unsightly. Although in laying a hedge it is not necessary to make it more than 4 feet to 4 feet 6 inches in height at the time, a hedge required for shelter as well as for fencing may be allowed to grow as high as 6 feet, up to which height it may be kept in shape with ease, though care is necessary to insure good bottom growth.

III.—HEDGES NOT OF WHITETHORN.

OTHER PLANTS SUITABLE FOR FORMING HEDGES.

So much that relates to hedge-growing generally has been stated in the section dealing with whitethorn hedges, that it only remains to mention a few of the more important items relating to other plants suitable for hedges. Nor is it necessary to deal with all the plants that could be grown so as to make a fence, the object of this paper being primarily to discuss such as are of chief practical utility.

The Blackthorn (*Prunus spinosa*) makes a good hedge, particularly on strong loams, which are generally regarded as being plum soils. The hedge is rather more liable to grow away from the bottom than is the whitethorn, and a particularly objectionable feature is the habit it possesses of spreading out into the fields by means of stolons. So strong is the habit of stoloniferous growth that I know of considerable lengths of hedges along ditches on the outsides of arable fields which have grown from bushes, though probably some of the growth has come from seeds which have grown beyond the stump: from whatever source I can testify to their denseness. If there is a place where it can be substituted with advantage over whitethorn it is on strong wet soils. When grown on the side of a ditch blackthorn has great tendency to extend down the bank, owing to its suckers. This is objectionable, as it hinders the cleaning, for want of which the hedge ultimately weakens.

Within comparatively recent years the Myrobella (*Prunus Myrobalana*) or cherry plum has attracted notice. On plum soils it thrives well, and grows with remarkable rapidity, quickly forming a fence, and providing shelter. In some instances brought under personal observation, when planted on light land it has not been so satisfactory, though I am not in a position to state whether want of more attention previously to planting had any effect on the small success. It possesses the advantage of producing stout thorns after it has been planted a few years. Where it grows well it is decidedly valuable for providing shelter in a short time. Owing to its rapid growth it is necessary to trim it twice a year to keep it from spreading wide and to insure denseness of foliage.

The Beech (*Fagus sylvatica*) is a favourite hedge in some districts, especially in exposed positions, and in wet situations. As a means of shelter for stock, hop gardens, or orchards it has special value, as it may be trained to a very considerable height without losing its compactness, and great height may be obtained although the fence is narrow. Its rapid growth renders it necessary to fence for protection of the young hedge for a far shorter period than is required by whitethorn. At the same time it cannot be regarded as so good a fence against cattle, and almost all old beech hedges show weakness at the base, big limbs with few lateral interlacing branches being present. Where used for fencing against cattle a ditch may be regarded as necessary to help it. Too close planting induces to speary growth, and the plants should not be placed nearer than 18 inches. Yet at 18 inches apart there is considerable danger of animals working their way through the thornless plants. The hedge should be clipped with hedging-shears in October.

The Common Crab (*Pyrus Malus*) is sometimes used as a hedge, but there is no good reason for resorting to it in preference to plants previously mentioned. Elm, maple, birch, and hornbeam are also used, but are worse if anything than crab, though the birch is occasionally found useful on thin soils at high altitude. For orchards some of the hardy crabs such as the Siberian may be regarded as deserving a place, as supplying shelter from winds, and also on account of the handsome fruit they bear.

Elder (*Sambucus nigra*) forms an absolutely bad fence. It is easy to raise, but has a straggling habit of growth; whilst its presence near other hedges is objectionable, because birds carry away so many seeds, and the unsightly elder becomes established in them, smothering out considerable lengths in course of time.

Poplars (*Populus*) are of little use against cattle, and are chiefly valuable as providing shelter, their rapid growth adapting

them as shelter for orchards and hop-gardens, and as nurseries to other trees.

The Alder (*Alnus glutinosa*) and the Goat Willow (*Salix caprea*) or Sallow are suitable for fences on very wet soils where other hedges would not thrive. Willow is easily propagated by placing freshly cut rods in water, when they soon develop a plentiful supply of roots. It is advisable to place them in shallow water, for at whatever depth they are immersed the rootlets form near the surface. Even if planted as cuttings in ordinary moist soil they will grow; the holes should first be made so that the bark does not peel off in planting. For fencing it is best to place them in the form of a trellis, when rods of two or three years' growth, and about 6 feet long. If planted about 18 inches apart so that the rows cross themselves at right angles a hedge quickly forms, and with a yearly trimming will keep a fair fence.

Evergreen Hedges.

Several kinds of evergreen are used for fencing, the best of which is Holly (*Ilex Aquifolium*), which, from its dense habit of growth, strong wood, and prickly leaves, makes a strong fence against animals and affords the best shelter both summer and winter. It is slow in growth, but once established is very lasting; a tight fence 5 feet in height and 16 inches through will hold in check any bullock. Those who have visited the Royal Agricultural Society's Experimental Farm at Woburn may have noticed the well-known Aspley hedge, where for several hundred yards there is a dense wall of holly thirty or more feet in height, perfectly compact and gapless, showing how dense the bottom growth may be maintained, even though the hedge is allowed to reach such a height. This grows on a thin sandy soil, and holly seems to affect such soils; the soils on which it thrives least are those which are wet and heavy. It is a point in favour of holly that the hedges may be grown perfectly upright, the shade and droppings from the parts above seeming to have no injurious effect on those below. Not only is this the case, but it grows well even under trees where other hedges do not succeed. Hedgerow timber is the greatest bane to most hedges; therefore, this feature possessed by holly makes it specially valuable.

As a rule, plants twice transplanted, and about a foot high, are used, and cost about 2*l.* per thousand. The process of planting is usually known as holing and covering, being similar to the spading-in of potatoes planted on the flat. The line of planting is indicated by a gardener's line, then a hole is opened along this by the aid of a spade, and a plant inserted and

held in it; a foot further along the line another hole is dug, and the mould thus procured is used to fill in the hole previously made. This, by covering in the roots of the plant being held there, completes the planting. The practice is continued all along the line, the earth being lightly trodden about the roots, but firmly enough to secure the plant, and the work is thus expeditiously done. The bed should be well prepared, clean, friable, and well manured. The plants should be freshly raised, and if dry should be moistened previously to planting. If in the course of a year or two it is evident that the plants have received a check, so that the root growth is not sufficient to maintain the top, the plants should be cut down near to the ground, when they will recover their vigour. With this exception it is better to allow them to grow to the height required as a hedge, and then to trim into shape. Almost any shape may be grown, as by trimming bottom growth may be induced, the plants having a natural tendency to produce lateral shoots low down. Trimming should be done with shears in July.

Furze, gorse, or whin (*Ulex europæus*), is an evergreen valuable for fencing on barren sands and in exposed situations where other plants would not be easily maintained. Owing to the difficulty of keeping the bottom growth thick it is advisable to grow it on a bank. A flat-topped bank about three feet in height, wide enough for a line of hedge to be carried, should be prepared, and the seed sown in March or April. The object should be to maintain a short sturdy growth; close clipping should therefore be resorted to in May or June. In the course of years, if weak places appear, new plants should be inserted. Experience has shown that furze hedges decay most readily when clipped at any time from autumn to early spring.

W. J. MALDEN.

Agricultural College, Uckfield, Sussex.

MAIZE AND ITS USES.

THE history of maize (*Zea mays*) is obscure, but there seems to be no doubt that the popular name "Indian Corn" was derived from the fact that, at the time of the discovery of America, maize was found growing in cultivated patches and was so universal on that continent that it was incorporated in the religious rites of the ancient tribes. We are now aware that this cereal had names in all the dialects of the red man, and that the aborigines

sowed it round their temporary dwelling-places when they were yet scattered tribes over the American continent. In examining the different accounts as to the place of origin of the maize plant, it will not do to rely in a haphazard manner upon an isolated proof, for there are still a large number of ancient monuments with hieroglyphic inscriptions which have to be deciphered that may throw considerable light on this question. A remarkable proof of the antiquity of Indian corn was furnished by Darwin, who discovered, buried in the soil of the coast of Peru, now eighty-five feet above the level of the ocean, a maize cob which is stated by the Smithsonian Institution to be the oldest known specimen.

As regards the origin of maize, Saint-Hilaire thought that he had found the parent type in a singular form, wherein each grain is entirely sheathed in a separate tunic or husk; it is known in Buenos Ayres as *pinsigallo*. Some of the older writers were of opinion that the parent type had been changed to the present form of maize by selection and cultivation, or by the influence of soil, climate, or accident. Notwithstanding these assertions the observations of Lindley, and the results of its cultivation by Professor Radic, point to the plant being what is termed a monotype, and indicate maize to be another valuable product for which the Old World is indebted to the New, regardless of the fact that, although America has been explored by many botanists, not one has yet discovered maize in a wild state. If America was not the place of origin of Indian corn the writers and sculptors in ancient times would have chronicled or left some representation either in Egypt, Greece, or Mesopotamia, for the plant towers so majestically above beholders that they could not but have admired the graceful inclination of its golden heads, the dainty green of its lovely leaves, the luxuriant tints of its stem, and its magnificent tassels undulating in the breeze. Longfellow, in his "Song of Hiawatha," has woven together many of the beautiful traditions of the American Indians, and in "Hiawatha's Fasting" will be found the cry of rapture of that young Indian on finding "this new gift to the nations,"—

> "Maize in all its beauty,
> With its shining robes about it,
> And its long, soft, yellow tresses;
> . . . . . . Mondamin!"

It seems certain that "Mondamin," the Indian name of maize, was unknown in Europe at the time of the Romans, so that those writers and botanists who allege that "the friend of

man," which is the translation of the word "Mondamin," came from the East during the middle ages, could not have fully appreciated the fact that travellers who visited Asia and Africa prior to the discovery of America were absolutely silent regarding the maize plant. The omission appears the more striking when one thinks of how amenable the cereal in question is to cultivation, and of the spread of cultivation of maize in the Old World *after* the discovery of America.

Some seeds of the maize plant were received and planted at Seville as early as the year 1500, and Joseph d'Acosta states that maize was extensively used as food by the inhabitants of Mexico when Cortes landed in that country in 1519, and it was further employed in religious ceremonies, the Mexicans shaping, by means of maize-flour, coarse effigies of their gods. There was a goddess bearing a name derived from maize—Cinteutl, from *cintli*—who received the first fruits of maize as the Greek goddess Ceres received those of our own cereals.

Some writers aver that, like rice, maize was first known in China, where it was cultivated to its present state of perfection, but against this we have the fact that maize was grown in both North and South America, anterior to its discovery by Europeans, from La Plata to what is now the United States, and further that the Chinese were not aware of the New World until they learnt of its existence from European travellers. The voyage of Magellan from South America to the Philippines took place in 1520, and there does not seem any reason to doubt that maize formed part of the diet of the ship's company, and that they introduced the first seed into China, but it is not until some fifty years after its introduction that any mention of its cultivation is made by Chinese writers. However, the cultivation of maize spread quickly over the sub-tropical regions of Asia. In fact the rapidity of its extension formed quite a contrast to its cultivation in Europe. Even in Egypt we find no mention of its growth by Prosper Albin, who gave an account of his travels in that country in 1592. At the end of the eighteenth century, again, very little maize was grown in Egypt, and Forskal states that it had not then received a name to distinguish it from the Sorghums. To-day we see maize an important cereal crop in Spain, Southern France, Italy, Turkey, South Russia, North and South America, the states of the Danube, Roumania, Bessarabia, Servia, Bulgaria, Southern Hungary, and the sub-tropical districts of Asia, Africa, and Australia. The names assigned to maize or Indian corn in most European languages are misleading, but now that it forms such an important staple in the commerce of the world the misnomers are

gradually being corrected. The widespread appellation *Blé de Turquie*, *Blé Turc* (Turkey wheat), dates from the sixteenth century, and is as incorrect as the French *Coq d'Inde* applied to the "turkey," a bird which in reality is a native of America. In Lorraine and the Vosges maize was known as "Roman wheat," in Tuscany as "Sicilian wheat," in Sicily as "Indian wheat," in the Pyrenees as "Spanish wheat," in Provence as "Barbary wheat" or "Guinea corn," while the Turks call it "Egyptian wheat," and the Egyptians "Syrian Dourra."

Maize has of late years increased in cultivation by enormous strides, and this, like every other food product, has felt during the past half-century the progress of civilisation, until it now forms, next to wheat, the most important of all cereal crops, while it thrives under a greater range of temperature than the other cereal grasses. In fact this cereal will germinate at a temperature as low as 49° F., and as high as 115° F., although the best temperature for its growth is 93° F. Some idea of the extent to which maize, or, as it is simply called in the United States, "corn," is grown can be formed when we mention that the area devoted to its cultivation in the United States alone is about seventy-eight million acres, an extent greater than the whole of Great Britain, Belgium, Holland, and Denmark combined, and the annual yield now is over 250 million quarters. In fact the measured quantity of this crop gathered in a single year in the United States has exceeded that of the wheat harvested the world over. The leading countries that produce any quantity of maize after America are the states of the Danube, Roumania, Bessarabia, Servia, Bulgaria, and Southern Hungary. It may be mentioned here that the "corn" from these districts is round, and commands in ordinary years about 1*s*. to 1*s*. 6*d*. per quarter more money than the flat corn from the United States.

It may be well, before investigating further the question of how much maize is grown in different countries, and of those that produce more than enough for their own consumption and therefore supply the United Kingdom, to examine the plant. Maize is a gramineous plant, and where it is grown for its grain, as in the United States, the dried leaves are utilised in winter as fodder, and the stalks for thatch and for fuel as well as for making baskets, while the fibres of the culm and leaves afford a durable kind of yarn. In fact, when one considers the use that different plants in the vegetable kingdom are put to, it will be found that very few have a greater variety of uses than maize. The stem of the maize plant, which is filled with a pithy fibrous structure, is divided at irregular intervals by nodes, and its strength and solidity are increased by a silicious outside covering.

From the lowest and sometimes from the second and third node it puts forth brace roots that help to support the whole plant, growing as it sometimes does to sixteen feet in height, although the minimum is generally three feet and the average height from eight to ten feet. The fruit, which is developed within the leaf sheath at the node, that is to say in the axils of the superior leaves, consists of a "cob" with the grain disposed upon it in regular rows of from eight to twenty, and surrounded with foliaceous sheaths which hang down like silken tassels. These threads attached to the grain usually extend beyond the closely folded tips of the imbricated leaves that wrap the "cob," which is from half an inch to three inches in diameter, and from two to sixteen inches in length. The leaves, which are alternate and sheathed at the base, vary from one to three feet in length, and from three to four inches in breadth. The male flower, which takes the form of a tassel at the top of the stem, produces an abundance of light, dry, loosely attached pollen.

The root is fibrous, and in order to ascertain the distance to which it penetrates the soil to procure its nourishment, some interesting experiments were carried out a few years ago at the North Dakota Agricultural College. For this purpose an iron frame was constructed in the shape of a cube five or six feet in each of its dimensions, and was filled with shelves of wire netting placed one above the other, with intervening spaces of about two inches. These frames were sunk in the ground entirely beneath the surface. Maize and wheat were then planted on the ground, and, as the plants grew, the roots were not obstructed by the layers of wire netting imbedded in the soil beneath, but forced their way readily through the meshes. In the autumn the frames were dug out and the soil washed away with water. The netting held the roots in the very position in which they grew, and a valuable object lesson for the study of root growth was presented. The roots of the maize plant had gone beyond the six-feet limit, and some of the roots were broken off in removing the frame. In the case of the wheat plant, the roots had in some cases gone downward to a depth of between three and four feet.

As regards the grain it is found on examining it with the microscope that the external coat is made up of two membranes. The *outer* of these consists of some seven or eight layers of cells running in one direction, and about three times as long as broad; margins of the outermost layer are beaded, the beading being remarkable for a certain squareness of outline. The *inner* membrane consists of a single layer of thick partitioned fibrous cells. The cells of the cellulose are very angular, like those of rice, but they

differ in being subdivided by numerous septa forming a cellular network, each space inclosing a separate starch granule. The illustrations (figs. 1 & 2) represent a portion of a grain of maize and a portion of the wheat grain highly magnified in order to show the difference in their structure and the varying thickness of the different skins. The starch granules of maize are somewhat polygonal in outline, and present well-marked central depressions, as also occasionally a divided and radiate hilum; they differ, however, in their much larger size, in not forming compound bodies, and in presenting under the polariscope well-defined crosses. At the exterior of the maize grain the starch corpuscles or granules are packed very closely

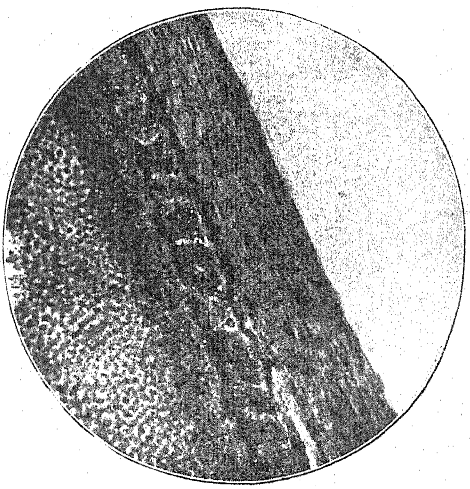


FIG. 1.—Photo-micrograph of a portion of the grain of maize.

together, while in the interior of the grain the starch is less coherent and softer, and the granules are apt to assume a more spherical shape. The average size of maize starch with core cavities is from 0·0132 to 0·022 mm., and as before mentioned the granule is apt to show an ample cavity, which is frequently star-shaped.

The internal construction of the grains of maize and wheat will well repay study. While the grain of maize may considerably vary in shape, and the wheat grain generally has an irregular oblong oval outline, with a deep groove extending from end to end, the central portions of both cereal grains are affected in the same way by the influence of the sun's rays during their maturation. The illustration in fig. 3 shows how the starch granules are

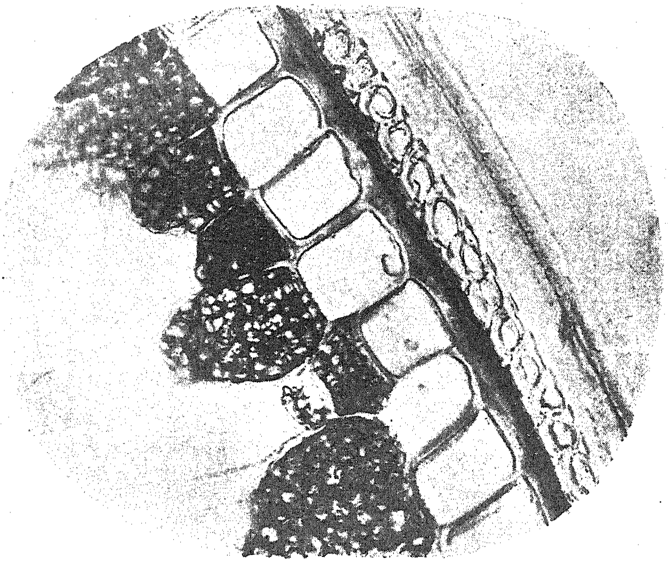


FIG. 2.—Photo-micrograph of a portion of the wheat grain, showing skins.

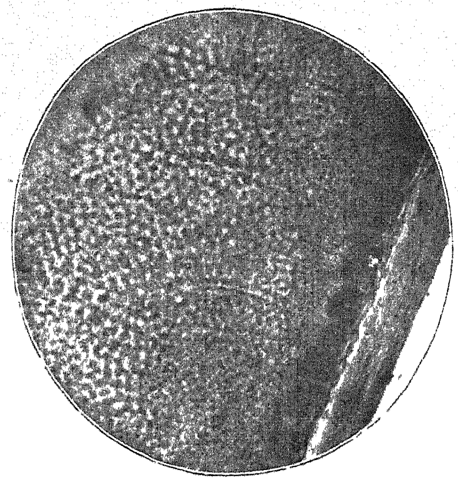


FIG. 3.—Photo-micrograph of portion of maize, showing how the starch granules are packed.

much more matured near the skin, while fig. 4 gives some idea as to the manner in which the starch is developed in the interior of the wheat grain.

Writers who have studied the different cereals admit that there is no species of cereal that manifests itself under such varied forms, sizes, and colours as the maize plant. Varieties are met with exhibiting every grade of size, colour, and conformation, caused by climatic influences, selection, cross-fertilisation, and cultivation. In the United States alone the many varieties afford a striking contrast. Take, for example, the shrubby reed that grows on the shores of Lake Superior and the gigantic stalks of the Ohio valley; the tiny ears with flat, clear, clinging grains

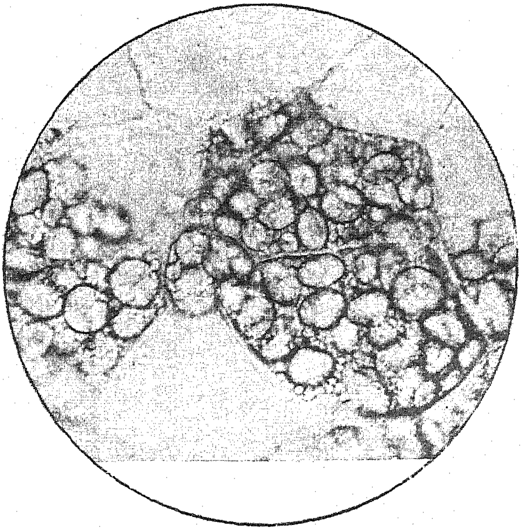


FIG. 4.—Photo-micrograph of interior of wheat grain, showing the packed starch, &c.

grown mostly in Canada, but also on the northern borders of the United States; the brilliant rounded little pearl or the bright red grain and white cob of the eight-rowed hematite, and that of the swelling ears of the big white and yellow round seeds of the Southern States. The heaviest maize is grown in Virginia, North Carolina, Kentucky, and Tennessee. It will thus be seen that as there is such a contrast between different sorts of maize, and as cross-fertilisation has been resorted to during the past three hundred years, the varieties grown must now be exceedingly numerous.

The mere fact, then, of the variability of the maize plant and its pliancy of habit has given it an adaptiveness to large

regions of country with varying climate, and it is not surprising, therefore, to learn that the total number of varieties is put at 211. Of this total we have evidence of about 130 varieties cultivated in Spain, the country to which corn was first sent from the New World. On our own markets we find that maize sent from the states of the Danube, which is round, fetches more money than the flat maize from the United States, while the soft white grain, and the *chulpui*, the grain of which is translucent, is liked better in Bolivia than all other kinds for the preparation of torrified meal, which is known as *tostada*, and takes the place of bread in many localities in that country. *Culli* is the name of a remarkable variety grown in South America, the grain of which is of a mulberry hue, and is often, on that account, used to colour liquors, &c. Another variety of maize, called Chile maize or Valparaiso corn (*Zea Curagua*), is distinguished by its serrated leaves, and this sort has won a superstitious regard from the circumstance that its grains when roasted split into the form of a cross. This variety is a smaller plant than the average, and is a native, as it name implies, of Chile.

As to the distribution of the maize plant over the face of the earth, the cultivation of maize extends to latitude 40° north and south in America and to latitude 50° to 52° north in Europe. The main bulk of the total crop grown each year is produced in the United States, where 82,075,830 acres were under cultivation in 1895, and produced some 268,892,000 quarters of grain. But maize is also an important factor in the rural economy of the European countries of the lower Danube, of Mexico, and of the Argentine Republic, and is a scattered crop in most of the countries of the world where climatic conditions are favourable to its growth. From official sources and from some of the best commercial estimates, the following table, giving the maize production in the principal countries that make it one of their main cereal crops, is compiled:—

Countries	Production in 1896. Qrs. of 480 lb.
Argentina	10,000,000
Austria-Hungary	17,500,000
Bulgaria and East Roumelia	800,000
Canada	2,700,000
Egypt	4,300,000
Italy	9,200,000
Roumania	8,000,000
Russian Empire	4,580,000
United States	286,000,000
Uruguay	700,000
Total qrs.	343,780,000

The value of maize as human food is most appreciated in the American countries in which it is grown. In the United States about 92 per cent. of the maize crop is consumed at home, in fact 80 per cent. of this cereal never leaves the State in which it is grown. In Europe the principal use to which the cereal is put is for animal food. Being used in competition with the cheaper cereals, milling offals, and root crops, the volume of the trade depends upon the price realised in the countries where there is a surplus grown, and the price there is controlled in turn by the local requirements for domestic purposes. The United States exports about 8 per cent. of the total grown, and their consumption works out at 14·73 bushels *per capita*. It is interesting to note in this connection that the consumption of wheat in the United States *per capita* is only 4·78 bushels, whereas in the United Kingdom we consume nearly 6 bushels *per capita*. Maize is also cultivated in many districts of Canada, but the quantity stated officially to have been exported does not really represent the total quantity that leaves the Dominion, as a large amount is shipped at United States ports, and is then reckoned in the American returns and omitted in the Canadian figures. The country that we have previously referred to, whose people at the beginning of the sixteenth century worshipped the goddess of maize under the name of Cinteutl—Mexico—grows a large quantity of maize, but not sufficient to meet requirements, so that a fair amount is imported from the adjoining States.

In South America, Paraguay makes maize its main cereal crop, while Bolivia is not able to export much maize, on account of its land-locked condition, and the unlikelihood of any further extension in the area under cultivation arises from the fact that its wide rivers are unnavigable by reason of their several rapids. Peru not only produces sufficient maize for its own consumption, but exports its surplus to Chile, while the maize plant is found to be easily cultivated in Brazil, but is overshadowed by the attention given to coffee and sugar, and to some extent is discouraged by the high cost of carriage. The Argentine Republic now produces about eight to ten million quarters of maize, a third of which is consumed in the country, while the remainder is exported to the Brazils, South Africa, and Europe. In this fertile country there is a probability of the area under maize being considerably extended, as there is an increased demand, and the yield averages 24 bushels per acre, but sometimes reaches 60 and even 90 bushels. Chile, on the other hand, grows a fair quantity of maize, but her principal export staples are wheat and barley. Maize is the main cereal crop in Uruguay,

and considerable quantities are raised in the Banda Oriental, from whence moderate exports to Europe and Brazil are made at times.

Leaving the New World and making a hasty survey of the most ancient of civilised kingdoms, we find that China now cultivates large tracts of maize in her northern regions, while in the southern regions of this vast empire rice takes the place of maize. For cultivating and preparing the land for maize, the hoe here holds the place of the spade, while the plough in use retains its primitive simplicity. As regards India, some idea of the extent to which maize is cultivated is obtained when we mention that, although rice is the staple, maize is the food for the stronger race, and that notwithstanding there are over 300,000,000 people to be fed in that vast possession of ours in the East, there is a small surplus of maize exported to the United Kingdom. Turning to the African continent, Egypt, on account of her present condition, must not be classed as a maize-exporting country, as the small amount that has been sent out of the country in recent years is more than counterbalanced by the feeding stuffs imported for use in the Soudan. Morocco, perhaps the most fertile country in Africa, and regarded by some authorities as the future granary of Europe, grows maize, but by reason of its bad administration the surplus stock of that cereal only occasionally finds its way into the English market. In South Africa maize is grown in several districts, but to meet the requirements of that part of the world maize from the American continent is imported. Australia grows more than a million quarters of maize, but as the requirements outstep the amount produced, maize is imported from North and South America.

We still have the remaining continent to deal with, namely, Europe, which now consumes a considerable quantity of maize, and will, no doubt, in a few years, materially increase that amount. In Portugal maize is the only feeding stuff raised in any quantity, while in Spain, where there are some 130 different varieties, the production does not reach more than from one to one and a half million quarters. In the south of France a small quantity of maize is grown, but in Italy there is usually an average crop of eight million quarters, which amount is insufficient for the requirements of the country, so that some has to be imported. In connection with this importation the Government in June 1895 suddenly raised the import duty on white maize from 2*s.* to 12*s.* 7*d.* per 480 lb., because it was being employed to adulterate wheaten flour. Greece cultivates maize, but has also to import to meet her requirements, while

Servia exports a fair amount for that country. Roumania, as might be inferred from the table given on p. 124, exports a considerable quantity of maize, while Russia, where maize can only be sown in the spring, exports between two and two and a half million quarters. A small trade is carried on in Turkish maize from Dedeagatch and Salonica in Europe, while the extent to which it is cultivated in Asia Minor is unknown, although a little is exported. Austria and Hungary import maize from Russia, Roumania, and Servia, but grow together about 16,000,000 quarters, while Bulgaria and Eastern Roumelia export a little, but produce about 1,000,000 quarters.

The foregoing details concerning the regions in which maize is cultivated are interesting, as showing the vastness of the territories from which this cereal can be procured. Although wheat is characterised as the "staff of life" and the most nutritious food for man, yet maize is not second in value—if we consider the United States crop—to any produce of the earth, and of late years it has particularly attracted attention in England, being utilised largely in different manufactures in place of the older cereals. It may be noted that maize reaches the United Kingdom principally from the United States, the Black Sea ports, and South America, and imports go on steadily increasing. Looking closely into the statistical position, it will be found, however, that the larger importation of maize has not materially displaced barley and oats, as is shown by the subjoined table, the value of which lies, in no small measure, in its disproving what, in the absence of figures, would be the most obvious assumption:—

Imports of Maize, Barley, and Oats into the United Kingdom.

Year	Maize	Barley	Oats
	tons	tons	tons
1891	1,341,281	873,284	830,019
1892	1,769,061	713,867	783,069
1893	1,648,664	1,142,228	697,749
1894	1,772,608	1,062,069	748,960
1895	1,705,476	1,180,943	778,960
1896	2,607,010	1,123,866	879,336
1897	2,740,734	947,936	805,840
1898	2,931,154	1,222,850	778,895

A study of this table naturally suggests the question as to how the increased quantity of maize imported into this country is consumed, if it does not materially displace barley and oats. As there might possibly be a great increase in the number of live stock in the country, this would account for the increased

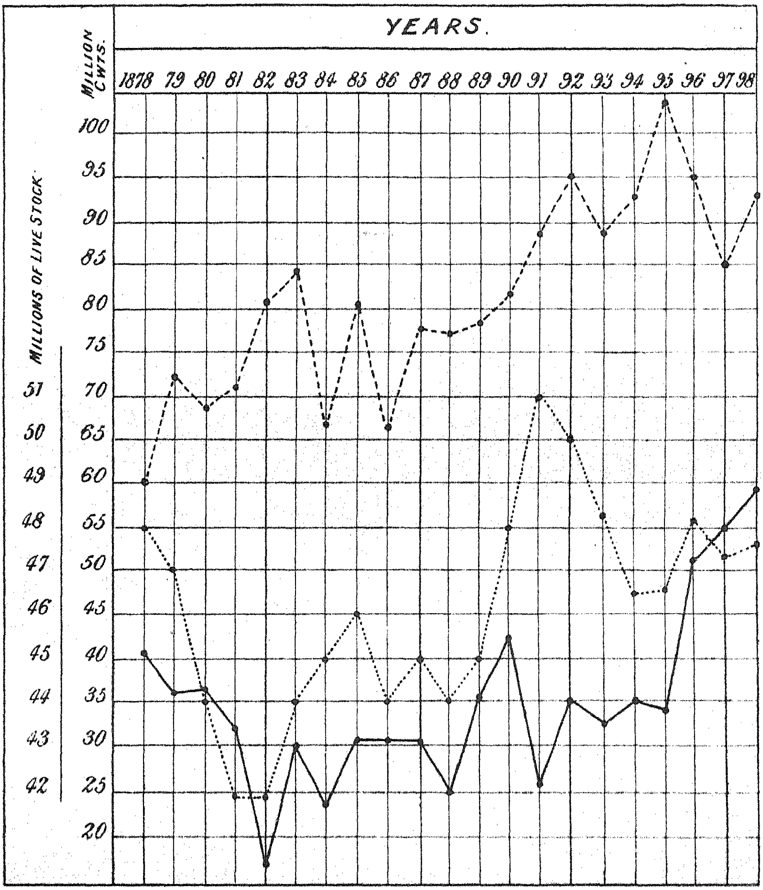
consumption. Hence the inquirer turns to the statistics dealing with that branch of the agricultural industry, only to find, however, the figures given in the above table still more perplexing. If we take the total cultivated area in Great Britain —which is returned as 32,520,076 acres, of which 16,512,868 acres are given as pasture, and 16,007,208 acres as arable—we find an increase of 4,440,012 acres of permanent grass from 1871 to 1897. But if we take into account the head of live stock in 1878, the year before the depression in agriculture is generally stated to have commenced, we find the total almost the same. In 1878 there were 48,027,332 head of live stock—live stock in this instance includes horses used solely for agriculture, mares kept solely for breeding, unbroken horses, and cattle, sheep, and pigs on the farms, as they all consume feeding stuffs. In the years 1879, 1880, 1881, and 1882, the number of head slowly decreased to about 43 millions, and between the years 1883 and 1889, the numbers fluctuated between 44 and 46 millions, while in 1890 the figures again increased to 48 millions odd. In 1891 the number of head of live stock rose to 51,176,608, but the following years show a decline, until last year, when the return shows the number as 47,323,766 head.

What is done with the increased quantity of maize that is now sent to the United Kingdom? The answer to this question evidently must be looked for elsewhere, and the diagram on the opposite page, of the amount of breadstuffs imported, the quantity of maize imported, and the total number of live stock in Great Britain from the year 1878 to the end of December last, gives a clue as to where some of this maize goes.

Looking closely into the diagram we notice one curious fact, namely, that the falling off of the total weight of breadstuffs imported corresponds materially with the increased consumption of maize during the three years 1895 to 1897. We were aware that large quantities of maize were consumed in the United States in the production of beef and pork, and that this cereal was universally in requisition for human food, appearing on the table at all meals and in a multitude of forms, but it will be news to many English farmers that a considerable quantity of maize is most scientifically manufactured for the purpose of being sold for admixture with wheaten flour, and so consumed on our tables as bread.

There is a population at the present time, according to the Registrar-General, in the United Kingdom of 40,188,927, and to feed this number of persons it takes about 29,500,000 sacks of 280 lb. each of wheaten flour. Now if we look into the statistics of breadstuffs for 1897—the imports of wheat and

wheaten flour and the agricultural returns for Great Britain and Ireland—we find that only sufficient wheat was imported to produce, with the English wheat added and the total foreign flour, a grand total of 26,710,064 sacks of pure wheaten flour.



Total Breadstuffs .... Maize _____ Live Stock ....

These figures disclose a deficiency of over $2\frac{1}{4}$ million sacks of wheaten flour to meet ordinary requirements. And in answer to the question as to how this deficiency was made up, the trade reports that the stocks of breadstuffs, usually a fair amount, held over from previous years were very much reduced, and on

account of the Leiter corner in May wheat prices were forced upwards further than was considered justifiable by the bakers, who instead of purchasing flour to replenish their stock, preferred to consume their holdings even to the extent of exhaustion, rather than be caught buying at the highest level of prices. In this way a certain proportion of the deficiency in the amount turned out by the mills was made up, but a considerable quantity was still required, and, according to the best authorities in market statistics, from $1\frac{1}{2}$ to 2 million sacks of maize flour were mixed with the wheaten flour in order that the miller or baker might not only make up the deficiency in quantity of wheaten flour but obtain a profit by means of adulteration.

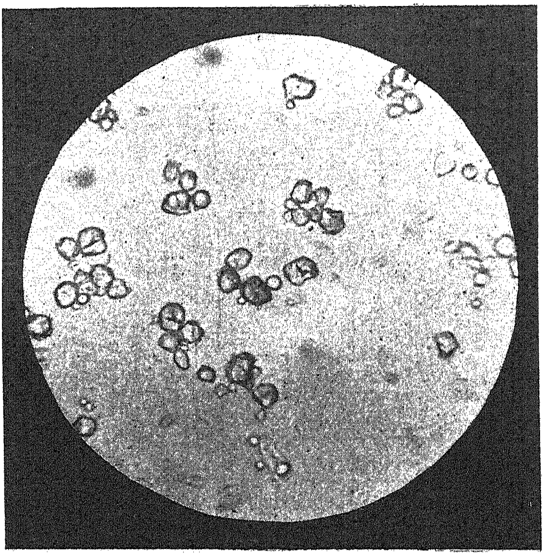


FIG. 5.—Photo-micrograph of starch from maize flour.

We know that for some years past maize has been used as an adulterant, especially in oatmeal, mustard, and pepper, as well as being used by confectioners and jam-boilers, but many readers will be surprised to learn that maize flour has taken the place, to a very great extent, of wheat flour for "sizing" purposes in the cotton mills of Lancashire and Yorkshire. Not only is the demand for wheat restricted by this displacement, but the amount that should have been consumed in the manufacture of "sizing" flour remains on the market, with the result that the value of the whole stock of wheat is

depreciated, and much more than the displacement would seem to warrant. It is natural that, the demand having been lessened and the supply increased on the markets, wheat prices, according to the well-known law of supply and demand, should take a lower level. This adverse effect on wheat prices is still further intensified by those persons who fraudulently add maize flour to the wheaten flour that they sell. That such an adulteration is practised will be seen from the illustrations, figs. 5, 6, and 7. The illustration in fig. 5 represents a photo-micrograph of starch from maize flour, which, it will be observed, is distinctly pentagonal or hexagonal in shape, but sometimes this starch has

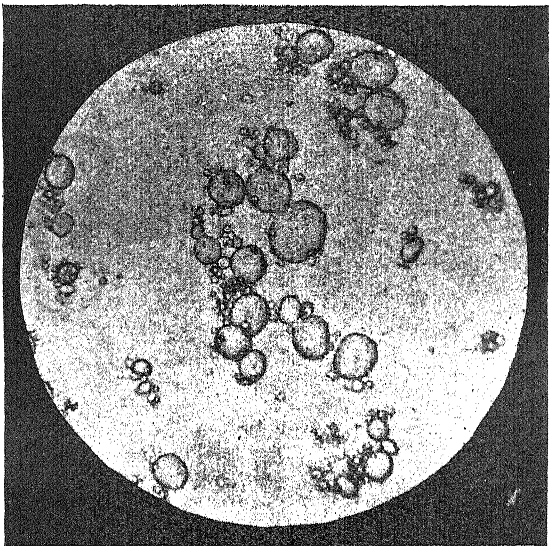


FIG. 6.—Photo-micrograph of starch from pure wheaten flour.

rounded corners, as a result of the way in which it has been treated in its manufacture in order to disguise it when used as an adulterant. Even then it is apt to show an ample cavity which is generally star-shaped.

The next illustration, fig. 6, is a photo-micrograph of the starch from pure wheaten flour, and here it will be noticed that the form of the starch is quite different from maize starch, wheat starch consisting of two sets of granules, both circular but one much larger than the other. With these two illustrations before one it is easy to see that in the illustration, fig. 7, we have an

adulterated sample of flour, and that the adulterant is maize. It should be mentioned that the samples from which these three photo-micrographs were taken were separately obtained from stand-holders on the Mark Lane Corn Exchange by the writer. It seems almost unnecessary to point out that the falling off in the consumption of pure wheaten flour means a loss to the British farmer, for as everyone is aware a diminished demand for wheat means that the corn merchants and factors must part with the wheat at less money than it would otherwise have made to get rid of the stock. Another influence, perhaps somewhat indirect, is that a large stock of maize in this country cheapens mill feed, such as bran, middlings, &c., and the depression in mill offals

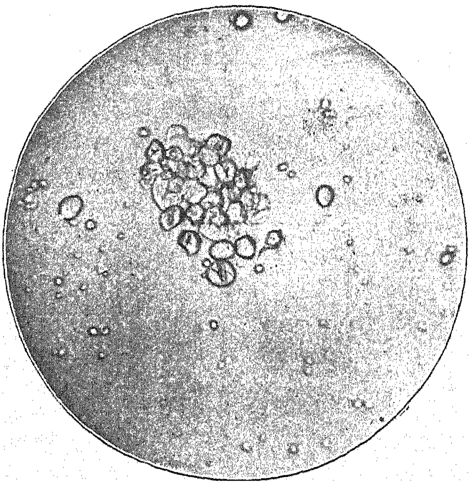


FIG. 7.—Photo-micrograph of starch from adulterated wheaten flour (maize starch is pentagonal in shape with star-shaped cavity, wheat starch is circular).

means that the English miller in buying English wheat must cut the margin very fine, and give less for the wheat on account of there being no profit on the bye-products of the mill. So we see that our millers cannot give such a good price for the English wheat sold by our farmers, much as they would desire to do so. Thus the sudden falling off in price and in the consumption of breadstuffs during the past three or four years is to a considerable extent accounted for.

Looking further afield we learn that, since chemistry has come to play so important a part in the manufacturing industries maize and its products are becoming increasingly employed in connection with preparations which within the last few years manufacturing firms have placed on the market. These are sold

tastefully packed under various names and conditions, such as cerealine, a delicate white chip; samp, a beautiful form of hominy; coraline, a gelatinised preparation; crystal rice, reminding one of popcorn; hominy grits, finely cracked maize; green corn, a favourite American dish; and corn flour, which in reality is maize starch, very largely used for making puddings, custards, and so forth. A large proportion of the starch made in England for laundry and other purposes is now produced from maize. In the United States not only are whisky and alcohol made from maize, but a kind of molasses and an inferior sugar are also produced from this cereal. Several years ago a St. Louis firm started the business of expressing oil from maize, and they state that they are able to get from a bushel of maize a gallon of clear amber-coloured oil. It should be mentioned that experiments made on the various kinds of maize grown show that this cereal is richer in oil than any other, containing as it does from 5 to 8 per cent. The oil is well adapted for illuminating purposes, giving a bright white flame, and developing in burning a quite high degree of heat. It is also advantageously used for dressing wool, as a machine oil, and in the manufacture of soap.

Maize in sundry forms is now extensively manufactured in mills specially built in different parts of the United Kingdom, in order to supply the prepared maize to brewers and distillers as well as to confectioners and jam boilers. Sometimes we come in contact with a product of maize in the form of glucose, and thus made the glucose is a valuable commodity, pure and wholesome. It may be that not a little of the golden syrup consumed in this country first entered the factory as glucose, and we know that all the honey sold is not the entire product of the busy bee. Glucose from maize even finds its way to the manufacturers of printers' rollers and into the tan yard. It will be remembered from the accounts published some years ago by Dr. Arthur Hill Hassall in his work "Adulterations Detected in Food and Medicine" that maize has been extensively employed to adulterate liquorice and—as already stated—oatmeal, mustard, and pepper. Maize flour of a low-grade quality has taken the place of low-grade wheaten flour in the manufacture of boots, where a quantity is required in faking up the soles with brown paper, inferior leather, &c.

Notwithstanding the many channels open to the extensive use of maize, this cereal was not consumed in any great quantity in the British Isles till the year of the potato famine in 1846, when 694,184 quarters were imported. Since then large and increasing quantities of maize have reached England, as shown in the following table, which gives the *average* annual imports of

maize into the United Kingdom from the year 1826 to the year 1897, divided into five periods of time, together with the highest and lowest quantity imported in each separate period :—

Period	Imports	Year	Lowest	Year	Highest
	qrs.		qrs.		qrs.
20 years, 1827–46	56,761	1833	7	1846	694,184
20 ,, 1847–66	1,958,627	1857	1,158,751	1847	3,614,637
20 ,, 1867–86	5,940,248	1867	1,992,767	1878	9,713,981
10 ,, 1887–96	8,247,439	1888	5,915,793	1896	12,166,046
1 year, 1897	12,790,000				

According to the figures published in the Trade and Navigation Returns the imports for the year 1898 considerably surpass the figures as returned in 1897, for in the twelve months that ended with December last we imported 13,678,721 quarters.

In considering the nutritive value and usefulness of maize as a human food, it is necessary to inquire into the chemical composition of the cereal. From an elaborate series of published investigations, we have obtained the estimated average percentage composition of the cereals employed in bread-making as follows :—

Average Composition of the Grain of Cereals.

—	Old wheat	Barley	Oats	Rye	Maize	Rice
Water	11·1	12 0	14·2	14 3	11·5	10·8
Starch	62·3	52·7	56·1	54·9	54·8	78·8
Fat	1·2	2·6	4·6	2·0	4·7	0·1
Cellulose	8·3	11·5	1·0	6·4	14·9	0·2
Gum and Sugar	3 8	4·2	5·7	11·3	2·9	1 6
Albuminoids	10·9	13·2	16·0	8·8	8 9	7·2
Ash	1·6	2·8	2·2	1 8	1·6	0·9
Loss, &c.	0·8	1 0	0·2	0·5	0·7	0·4
Total	100·0	100 0	100·0	100 0	100 0	100 0

In comparing the analyses of these cereals, attention may be directed to the differences in the percentages of oil or fat, to the varying quantities of starch, and to the fluctuations in the proportions of albuminoids. In wheat the albuminoids include the gluten, which plays such an important part in the process of bread-making; but in regard to the amount of the albuminoids in maize, it may be mentioned that the range of variation is not nearly so wide as that of the same constituent in wheat, but the material called zein, a principle analogous to gluten, has not the same power to make a light loaf

or is not developed to the same extent in the grain as gluten is in the wheat grain. Now one most remarkable fact in connection with the consumption of maize in this country is that it requires to be very judiciously eaten, must be well cooked and properly prepared, or the effects on the human body, no doubt due to a very great extent to climatic conditions, will be adverse. In those unaccustomed to its use maize as a food is considered to excite and to keep up a tendency to diarrhœa, and many complaints are heard from our prisons where it is almost exclusively used on certain days, while a good deal is consumed in Irish Poor Law dietaries.

Before considering the uses of maize as a food for live stock, it may be as well to call attention to a disease unknown prior to the first half of the eighteenth century, called *pellagra*, which is now common amongst the peasantry of Northern Italy, and occurs also amongst the same class in Corfu, Roumania, the Landes and Gironde in France, and Oviedo and elsewhere in Spain. The disease is not wholly due to poverty, as was at first supposed, but is traceable to the use of unwholesome maize, gathered before it is ripe and stored carelessly. It is strange, however, that in the native country of the maize plant, where it is so largely used as food, appearing on the table at every meal in a variety of forms, the consumers are not troubled in any way, not even with the symptoms of diarrhœa.

Concerning maize as a food for stock, we give below a table showing the percentage composition of maize fodder—that is, maize grown for fodder alone, and field-cured in the same manner as hay—and certain familiar forms of hay:—

—	Water	Ash	Albuminoids	Fibre	Nitrogen free extracts	Fat
Meadow hay	15·0	7·0	11·7	21·9	41·6	2·8
Red clover	15·3	6·2	12·3	24·8	38·1	3·3
Lucerne	16·5	6·8	16·0	26·6	31·6	2·5
Rye grass	14·3	6·5	10·2	30·2	36·1	2·7
Barley (grain in milk)	10·25	4·5	9·2	26·15	47·5	2·4
Oat hay	13·7	6·3	8·0	33·7	36·2	2·1
Maize fodder	32·1	4·3	4·3	22·1	36·0	1·2

A good deal of maize is used in the United States to feed pigs, but in this country barley meal is generally preferred, though an increased quantity of maize has lately been given to hogs in England; but although pigs fatten well on maize-meal, by reason of climatic conditions the food does not seem to assimilate as well as in America, and the result is that the waste in cooking the pork or bacon is enormous, while the flesh

is not so good as when barley meal has been consumed. It will be found, when employing artificial feeding stuffs, that maize must be used with great discretion in order that the fat on the animal may be not flabby but firm, and that the nitrogenous matter given to the stock in other foods may not be wasted.

Some persons have strongly advocated the introduction of maize into England as one of our regular crops, but in the majority of seasons this cereal, being of a sub-tropical habit, will not ripen in England. This, however, should not blind us to its value as a green crop. It admits of being sown much later than most other crops; from May 15 to 31 are the usual dates. Once started it grows very fast, and it can be cut green at any time during August and September that may suit the farmer. Unlike the white crops, it can be harvested in wet weather, and takes little or no harm if promptly ensiled with a small quantity of fenugreek or other sweetening condiment. It is rich in sugar, and cattle eat it greedily. Mr. John Bateman, at Brightlingsea, and the late Lord Tollemache, at Helmingham, grew it largely, and with unfailing success.

ROBERT W. DUNHAM.

Somerleyton Road, S.W.

THE MAKING OF THE LAND IN ENGLAND:

A SECOND RETROSPECT.

IT is only eleven years since this subject was treated in the Journal of the Royal Agricultural Society,[1] and it seems still one of sufficient interest and importance to justify some further remarks and illustrations. An opportunity for this is to be found in the recovery of 1,350 acres of land and swamp in a state of nature about 40 years ago, the inclosure award being dated December 19, 1861. The land in question was intercommonable of seven parishes, and its corporate existence would be found indicated in the map of Cambridgeshire under the extremely puzzling and unromantic title of Grunty Fen. It was a hollow surrounded on all sides by the low hills or "highgrounds," as they are called, of the seven interested parishes; it dipped to

[1] *The Making of the Land in England: a Retrospect.* By Albert Pell, Journal R.A.S.E., 2nd Series, Vol. XXIII., 1887, p. 355.

its lowest level towards the north, where was a tract of poor soil and pools for the most part swampy all the year round. Here was the natural gullet, formed by a dip in the high ground, through which the overflow of the stagnant water would discharge itself, but still leaving behind a depth sufficient to cover a very large portion of the Fen beyond the extent of the peat earth. Almost in the centre of the fen on its longer axis from east to west the surface rose a few feet, sufficiently high in places to escape flooding, but in winter time only to be reached by boat. Not a tree, not a shrub even of the meanest kind, broke the dreary monotony of its surface. Even the reeds were starved and not fine of their kind; only rushes and flags flourished at their best. Still at some early period it seems to have had attractions for our prehistoric forefathers.

On the surface, occasionally, a clean-cut, sharp, undamaged celt of the Neolithic period is picked up—and forty years ago a magnificent gold torque peeped through the turf. A farmer crossing the common at night, the moon shining, was attracted by something glittering in his way. On working it out with his knife it proved to be a gold torque in perfect condition, the metal of which was worth fifty pounds. Later on, the spot seems to have found favour in the sight of the Roman conquerors of the country, for on the elevated ridge, out of the reach of the flood water, they established a very considerable pottery, extending at intervals over a length of nearly a mile. Here the cultivator has brought to light the sites of several kilns, remains of the foreign red ware in use for patterns, or it may be domestic service, with several new names of potters not heretofore recorded, hand mills either for grinding corn or paste for the finer description of ware, polishing stones and other materials of the craft. After their departure the tract must have been abandoned to a state of nature wholly unproductive and uncared for. Much of the surrounding land is of a good quality, some of it unusually good. On the summit of the low hills to the south, traces of early British sepulture are so marked as to lead to the conviction that some of the earliest settlements were formed there, attracted by fine springs of water and the rich fertile soil. Then followed the division of the surrounding belt into parishes with their manors and clusters of houses, seven parishes in all, immediately contiguous to the Fen which then in time became intercommonable, that is, used by the commoners of the seven parishes, and then only for the grazing of their live stock and for a supply of fuel, peat out of northern lowest portions and "turves" (slow of combustion) off the drier pasture land. The fowling and fishing was shared, no doubt, between

the poacher and the proprietors of the right; the latter, however, down to the latest times, destroying the nets of the former and harrying the interloping gunners in their pursuit of wildfowl. Any attempts to exercise so-called public rights—such as grazing cattle from a distance, taking fuel to "foreign" homesteads, burning ashes to put on land out of the interested parishes, or squatting, or even camping as gipsies do, on this wild but not "no man's" land tract—was promptly resented and resisted. In this state of nature, then, the whole fen or common remained until the middle of the fifteenth century, when the attention of the country was directed to the removal of the flood water drowning thousands of acres and rendering them uninhabitable and profitless. The main works were undertaken and carried out by the Earl of Bedford and his associates. As a reward for their costs and exertions, portions of the districts benefited (the Great Bedford Level) were allotted to "the adventurers," and as among other larger and vastly more important works was a drain or "cut" of some miles length from Grunty Fen to the river Ouse near Littleport, a rectangular allotment of 426 acres of the highest land in the centre of the 1,776 acres of the fen was enclosed and became freehold land, but subject to a tax for the purpose of maintaining the works by which the great level of the fens had been rendered comparatively dry. A portion, however, of this 426 acres lay so low that the water had to be lifted out of it by a scoop wheel driven by a windmill. Nothing more was done by way of relieving the fen from submersion until about the year 1838, when, in order to prevent the body of water poured into the fen from the slopes of the surrounding seven parishes from passing down the Bedford Level drain into Littleport parish, a catchwater drain or dyke was cut all round the fen at the foot of the slopes or rise, but at such a height as to allow of its discharging itself by gravitation into the river several miles above Ely and Littleport. This work, costing 2,500*l.*, of course indirectly benefited the fen, which thenceforward received no more water than what fell in rain on its own area. It was now a common, bright with water in winter in the pools, as they were called, in the north, but only dotted with watersplashes elsewhere. There were fewer reeds, flags and rushes, but more thistles and ragweed. It was a paradise for goldfinches in the summer and fairly attractive for snipe in the winter. Great changes, however, had meanwhile been going on in the land that surrounded this fen. The seven parishes claiming rights on it had one after another, since the commencement of the century, been enclosed. Fine fields of grain and enclosures belted it in, and the contrast between the

"made" land with its hedges, roads, farm premises and labourers for ever busied on it, ploughing, sowing, mowing, reaping, and the dull sulky waste below with its stunted horses and uneasy cattle for ever shifting about in hungry search for a mouthful, was most striking. It had not the varied beauty of a wild Hertfordshire or Sussex common. No encroaching crops on the edge of it (this catchwater drain barred that), with the elder hedge round the cribbed garden, the white linen drying on it, the poultry at large, the children at play, the donkey flitted hard by; beyond, the patches of gorse and ling and the scattered ponds or pits where ducks and geese thrive and busy themselves in the most perfect health.

It was obvious that this "unmade" land could not remain in its state of nature, or rather of mauled nature, for this Bedford Level drain and the catchwater drain between them had made the life of the pike precarious, and deprived the wild duck of a safe nesting-place and resort, but had left enough water to unfailingly rot the scabby sheep, and establish ague in the shepherd's home. There was to be another change, the great one; the one thousand three hundred and fifty acres were to undergo the expensive process of manufacture and be "made" land as the word is understood in old-inhabited and cultivated countries.

In order to effect this change it was necessary that all having a legal interest in the fen or common should be consulted, and that the majority should agree to the course to be adopted. The persons interested besides the owners of the 426 acres of adventurers' land, were the commoners and the landowners of the seven parishes, and under action taken by outsiders the poor of these parishes as well as the lords of manors had also to have their claims, which did not come to much, taken into account. A short record of the proceedings has come down in writing from a landowner who, acting for himself and others, promoted the enclosure. It runs as follows:

In the autumn of the year 1857 I began to see what I could do towards the enclosure of Grunty Fen. It consisted (besides the four farms in the centre of it, comprising 425 acres allotted to the adventurers of the Bedford Level Corporation) of about 1,400 acres. Attempts and suggestions for its enclosure had been made during the past century, among others by Bentham the historian of Ely Cathedral, but they had always failed, and the enclosure had come to be looked upon as an impossibility. The fen was covered in places with anthills, and in summer with thistles which enticed large flocks of goldfinches. The portion under Witchford was swampy and was the abode of snipe, and there was rarely a day in the year on which some gunner was not in pursuit of them.

The last day I ever shot on the unenclosed fen I killed thirteen couple. This portion also was dug up for "sods." No one seemed to know who had

any legal rights on the fen; every one did what was right in his own mind on it. It was grazed to any amount, and people had in late years begun to dig it up and carry away the soil on to the adjoining lands. It had become a regular nuisance, and as it lay immediately under the new manor house which was built in 1847–48 I was determined the nuisance should cease. During the year 1857, therefore, I ferreted about in the records of the Court of Exchequer and in the Petty Bag Office, and ascertained what was the history of the other fens before they were enclosed. I ascertained what entries there were in the Court Rolls of the different manors adjoining the fen in regard to it, and having mastered all the facts that I could gather I arrived at the conclusion that the fen in former times, centuries ago, was precisely in the same position as the other fens in the Isle of Ely, and was part of the wastes of the adjoining manors and was in fact an inter-common. Prospects were held out of a *pro rata* allotment to all the highlands in the parishes abutting on the fen with small common-right allotments to the houses. This secured the requisite number of assents (besides those of the lords of the manors) and an Act was obtained for the enclosure. In time a valuer was appointed to adjust the interests of those having a legal claim to participate in the division of the fen, to plan and lay out the lots, to make the public roads and watercourses, and to hand over the recovered acres to separate ownership and cultivation.

Six hundred and twenty chains, or seven miles and three quarters of public roads, 30 feet wide, metalled 12 feet wide with 3 inches of gravel on 7 inches of burnt ballast, were made. These cost, with the drains or dykes alongside them, and some other independent watercourses and outfall works, 6,286*l.* 11*s.* 2*d.*; the bridges and tunnels connected with these, 424*l.* 3*s.* 8*d.* The valuer's remuneration at 16*s.* an acre on 1,350 acres came to 1,080*l.* In addition to these the fencing and levelling the recreation allotments cost 61*l.* 14*s.* 2*d.* It will thus appear that it cost the landowners—many of them very small people—8,452*l.* 9*s.* as well as a tax of 100*l.* a year for the passage of the water to the River Cam, equal at 3 per cent. to a capital sum of 3,300*l.*, or 11,452*l.* in all, to bring the fen out of its wild state up to its first stages of recovery.

If 50 acres be deducted for public roads and watercourses from the 1,350 acres of the fen, the remaining 1,300 acres had to bear this first cost, equal to a charge of 8*l.* 16*s.* per acre. Before, however, the allottees could bring their new possession into cultivation, the division fences had to be formed and gates put down. As planting, fencing, and rearing the quickset hedges was done at the cost of about 1*s.* a yard, and there still remained the levelling of the surface which was covered with holes and hillocks, the estimated total cost of these subsidiary operations would hardly come to less than 24*s.* an acre, bringing the cost up to 10*l.* an acre before a ploughshare could be driven through the turf or a beast be turned out to graze. In order to render a very large portion of the land fit for cultivation, under-draining

remained to be done, costing in 1862 about 3*l.* an acre, but at the present time nearly double that sum.

Some of the reclaimed land is certainly of a very fine quality, but a portion would not repay the cost of cultivation, and is still almost in a wild state, though encumbered with this heavy outlay.

The seven lords of the manors had allotted among them 23a. 0r. 7p., and there was set for the poor of the seven parishes 24 acres in all of recreation ground, and no less than 237 acres of allotments subject to rent charges.

The crowning evidence of modern civilisation is seen in a railway bisecting the fen, with two stations on it, bringing London within a two and a quarter hours' run, and St. Ives market within a run of thirty-five minutes, of these stations.

It is to be hoped that the short history of the process and cost of "making" the land, entirely apart from the cultivation of it, may with the other instances already given in this Journal (see footnote, p. 136) help to demonstrate the fact that the farm lands of England, before the cultivator or husbandman could turn a furrow or stock an acre, had first to undergo the process of manufacture at a large outlay of enterprise, money, and labour.

This the owner exclusively incurred and provided at his own cost and charges, and acting on lines distinctly special and antecedent to the cultivator's appearance on the scene. The latter then brought fresh capital and different methods into play, but not before the landowner had manufactured the artificial area to fit it for his productive operations.

ALBERT PELL.

Hazelbeach, Northampton.

Official Report.

ANNUAL REPORT FOR 1898 FROM THE PRINCIPAL OF THE ROYAL VETERINARY COLLEGE.

During the year 327 morbid specimens were sent by veterinary surgeons and others to the Laboratory which was established at the Royal Veterinary College in 1890 for research in Comparative Pathology and Bacteriology, and which has since been maintained by the aid of an annual grant of 500*l*. from the Royal Agricultural Society. A great variety of diseased conditions were represented in these specimens, the majority of which were forwarded owing to uncertainty as to the nature of the lesions present in them. In many instances the diagnosis of the disease from which the animal had suffered demanded a microscopic examination, and in a considerable number experimental inoculations had to be conducted. As was to be expected, a large number of the cases were furnished by the bacterial diseases, and by those which are occasioned by animal parasites. In the following pages a general survey will be taken of the incidence of some of the more important diseases of farm stock during the year 1898, and an account will be given of some fresh observations made regarding them from examination of the material forwarded to the Research Laboratory.

Glanders.

The published returns of the Board of Agriculture show that there was a substantial decline in the prevalence of this disease during 1898, the total outbreaks numbering 751, and the animals attacked 1,380, while the figures for the previous year were respectively 900 and 1,629. It is not improbable that this progress in the eradication of the disease is mainly due to the more frequent use which veterinary surgeons now make of mallein as an aid to diagnosis. In the Annual Report for 1893, it was mentioned that certain experiments had been carried out to test the value of this substance in the detection of glanders, and the statement was made that it was "likely to render most important service in any attempt to stamp out glanders." Since then mallein has been manufactured in the Research Laboratory and supplied gratis to veterinary surgeons on demand. The quantity thus supplied was, in 1895, 1,000 doses; in 1896, 1,464 doses; in 1897, 3,032 doses; and during the past year 3,763 doses. The great value of this agent in the diagnosis of glanders when the disease is not manifested by any outward

symptom is now so generally recognised that it is hardly necessary to accumulate further proofs of its reliability. In the free out-patients' department at the Royal Veterinary College many horses with no external symptom of glanders have been condemned on the ground of a reaction to mallein, and without any exception the accuracy of the diagnosis has been verified on *post-mortem* examination.

Unfortunately, horse owners are still very far from making full use of mallein when glanders breaks out, many employing it merely to assure themselves of the nature of the disease in animals that show external symptoms of glanders, whereas the full benefit of the discovery is obtained only by those who, when one of their animals is found to be glandered, test all the others in order that those found to be affected may be either killed or isolated. In this connection it may be observed that while the published returns of the Board of Agriculture may probably be relied upon to indicate the variations of prevalence of glanders from year to year, they must not be taken as affording accurate information regarding the numbers of animals actually affected with glanders. At the present time when an outbreak of glanders occurs, the law deals only with those that are visibly diseased, and shuts its eyes to the fact that in almost every outbreak slaughter which stops short at the obviously glandered horses leaves a number of cases of the disease among the apparently healthy. As long as this is allowed to go on, glanders will not be stamped out.

Anthrax.

As regards the number of animals attacked, this disease has fluctuated within very narrow limits during the last four years, the numbers being (commencing with 1895), 934, 904, 882 and 856. The 856 cases of last year were distributed among 558 different outbreaks, an increase of 125 outbreaks as compared with 1897.

In compliance with a request that was first made in the Journal of the Royal Agricultural Society for 1894 (Part II., p. 226), the great majority of those who have recourse to the Research Laboratory for assistance in the diagnosis of anthrax send an ear or a foot of the suspected animal, and in almost every such case a microscopic examination enables an opinion to be formed immediately as to whether the case was one of anthrax or not. Unfortunately, portions of semi-putrid spleen or other internal organ, or a bottle of blood taken from the heart or some large vessel, are still occasionally forwarded from supposed cases of anthrax, and during the past year in a small number of these cases no opinion could be given, since, as explained in the article quoted above, anthrax bacilli rapidly disappear from the internal organs when these become invaded by putrefactive bacteria after the animal's death. Examination of the blood immediately after death always enables one to determine whether the disease was anthrax or not, but some of the difficulties that occasionally attend diagnosis are illustrated in the following cases.

On January 29 last a pig's ear was received at the Laboratory, with the request that the blood in it might be examined for anthrax bacilli. A microscopic examination failed to reveal any of these germs. On the 31st one of the feet of another pig that had died at the same place was forwarded for examination, and the result was again negative. On January 2 a dead guinea-pig (A), which had been inoculated from the carcass of a suspected pig four days previously, was forwarded. Dissection of this guinea-pig showed a large inflammatory lesion at the place where it had been inoculated with pig's blood, and microscopic examination of the inflammatory exudate showed immense numbers of small ovoid bacteria of the fowl cholera type, but no anthrax bacilli. The spleen of the guinea-pig was not notably enlarged, but a few distinct anthrax rods were detected in its pulp, along with many small bacteria similar to those present at the seat of inoculation. The spleen pulp also contained many pale staining scarcely recognisable anthrax rods, evidently dead and disintegrating. By inoculation of appropriate media both the anthrax bacilli and the smaller ovoid organisms were obtained in artificial culture.

On February 3 all the blood that could be obtained from the pig's foot, examined for anthrax bacilli with negative result on January 29, was collected and injected under the skin of a guinea-pig, B. The result of this experiment was negative, the animal being apparently unaffected by the inoculation.

On February 2, a guinea-pig, C, was inoculated with a trace of liquid from the seat of inoculation in guinea-pig A. It died on February 13, and its dissection showed a large inflammatory swelling at the place where it had been inoculated, with very numerous small ovoid bacteria in the exudate, but no anthrax bacilli. The blood of the spleen pulp showed no bacteria of any kind. Tubes inoculated from the local inflammatory swelling yielded an abundant pure growth of small ovoid bacteria, but others inoculated from the spleen and blood remained sterile.

The correct interpretation of these results is probably as follows: Guinea-pig A was inoculated on January 29 with blood from a pig found dead that morning, and it died from a mixed infection, either owing to the operation having been performed with dirty instruments, or because, although only a few hours had elapsed since the pig's death, its blood had already become invaded by putrefactive organisms, including the small ovoid bacteria.

Guinea-pig B was inoculated from the foot of the same pig as that whose blood was used to infect guinea-pig A, but it remained unaffected, probably because any bacilli present in the blood of the pig's foot at the time of death had undergone degeneration and death in the five days which elapsed before the blood was used for inoculation.

Guinea-pig C was inoculated with material known to contain two species of organisms, viz. a few anthrax bacilli, and numerous small ovoid bacteria. It died from the effects of the latter only, because

the anthrax rods visible in the material used for inoculation had already lost their vitality or were too few in number to infect.

On June 30 a sheep's ear and spleen were received at the Laboratory for microscopic examination, in order to determine whether the animal had died from anthrax or not. The sheep had been subjected to a *post-mortem* examination on the previous day, about 12 or 14 hours after death. Microscopic examination of blood from the ear showed large numbers of anthrax bacilli, but a preparation made from the spleen pulp, when stained with methylene blue, appeared to be surprisingly (in the circumstances) free from bacteria of any kind. Attentive examination showed, however, numerous granules stained of a faint violet colour, and here and there the outline of an almost colourless rod, agreeing in size and shape with an anthrax bacillus, could be made out. These were taken to be anthrax bacilli on the point of dissolution, and the faintly violet granules were regarded as the remains of other bacilli of the same kind.

In order to ascertain whether the splenic bacilli were actually dead or not, a quantity of spleen pulp was shaken up with about twenty times its volume of sterile water, and half a cubic centimetre of the mixture was injected under the skin of a rabbit. As a control experiment another rabbit was inoculated by scarification of its ear and rubbing in of a trace of blood from the ear of the sheep. The latter rabbit died from anthrax on the third day, but the one inoculated from the spleen pulp remained unaffected.

The case is illustrative of the tendency of anthrax bacilli in the deeper parts of the body to die and disintegrate after the animal's death, but a remarkable point is that the disappearance of the bacilli was not in this case due to an invasion of the body by putrefactive bacteria, for the spleen had no odour of putrefaction, and on microscopic examination appeared to be almost free from bacteria of any kind.

It has been pointed out in previous reports that an unopened anthrax carcass soon becomes innocuous after burial, and that in all probability the persistence of the disease in certain fields is the result of former surface contamination with the discharges voided from the bodies of anthrax animals before death or during the interval that elapses between death and burial, and is not due, as Pasteur suggested, to the transport of anthrax spores from buried carcasses to the surface of the graves by earth-worms. In the recently issued leaflet of the Board of Agriculture on anthrax, it is advised that the carcasses of animals dead of anthrax should be buried in some specially enclosed place to which cattle and other farm animals have no access. This, of course, involves transport of the dead carcass, and creates an altogether unnecessary risk of further surface contamination and spore formation. When animals are found dead from anthrax in the field, if the depth of soil permits it is probably better to bury them promptly on the spot.

Anthrax Vaccination.

During the past year 87 cattle of various ages were vaccinated according to the method introduced by Pasteur. These constituted the entire stock of cattle on a farm on which during the previous month two valuable animals had died from anthrax. The vaccin employed was obtained from the Société du Vaccin Charbonneux Pasteur, and the operations of the first and second vaccination were carried out without any mishap. Moreover, the further results of the vaccination may be said to have been quite satisfactory, for no case of anthrax has since then occurred among the animals operated upon. But there are grave reasons for doubting whether this freedom from disease during the nine months that have elapsed since the animals were vaccinated ought to be ascribed to protection conferred by the operation.

The so-called "vaccins" used in the operation are weak or attenuated cultures of the anthrax bacillus, and the object of the operation is to set up a mild, non-fatal attack of anthrax, in the expectation that the animal will afterwards for a certain period be insusceptible to the disease. It may be said that when vaccinated animals subsequently escape the disease, that is *prima facie* evidence that the operation has protected them, but that is true only when large numbers of animals are dealt with, and when there is an experience enabling one to calculate with some approach to accuracy what would have been the mortality among the vaccinated animals if they had not been operated upon. These conditions were not fulfilled in the present instance, for the only cases of anthrax on this farm of which any history could be obtained were the two which occurred during the month preceding the vaccination. It is therefore quite impossible to calculate what number of the animals, if any, would have contracted the disease during the next nine months if things had been allowed to take their natural course. There is, however, a comparatively simple way of testing the protective effect of vaccination against anthrax in any given case, viz. by attempting to infect the vaccinated animals, and it was resolved to employ it in this instance. With that object three experimental animals—a sheep, a cow, and a donkey—were vaccinated with the same material used for the 87 cattle on the farm. The sheep was vaccinated strictly according to the directions, but the first vaccination was omitted in the cases of the cow and the donkey. Seven weeks afterwards, viz on July 21, the sheep was inoculated subcutaneously with 1 cubic centimetre of bouillon holding in suspension a virulent growth of anthrax bacilli (and spores) cultivated on agar, and the donkey with 2 cubic centimetres of the same liquid. The sheep died on the fourth day afterwards, and the donkey succumbed a day later, and in each case microscopic examination of the blood showed large numbers of anthrax bacilli. This, of course, was not the result that had been expected or desired, and it must be confessed that it raises grave doubts as to the value of the so-called protective vaccination against anthrax, at least with

the vaccin supplied by the Société de Vaccin Charbonneux Pasteur.

In view of the results obtained in the case of the sheep and the donkey it was not considered necessary to test the cow in the same way, and it was therefore reserved for another experiment.

Tuberculosis.

In the Annual Report for last year an account was given of certain experiments which were made with the object of determining what is the most reliable evidence, at the *post-mortem* examination of an animal affected with tuberculosis, that the disease has become generalised. The following experiments were begun in 1897 and completed during the past year, and they ought to be read in connection with those referred to above. The object of them was to ascertain whether in a case of generalised tuberculosis the apparently healthy parts of the carcass contain the germs of the disease. In all, four series of experiments were made, three being with parts of animals (cows or steers) in which the disease had been experimentally generalised by injecting tubercle bacilli into one of the jugular veins, while in the fourth series the parts tested by experiment came from a tuberculous cow in which the disease had become naturally generalised. Only the first series of experiments need be here described in detail.

The materials used for this series of experiments were taken from a cow which was killed on the twenty-third day after the injection of 3 c.c. of bouillon holding in suspension a great number of tubercle bacilli from the mesenteric gland of a horse. The *post-mortem* examination of the cow revealed a dense crop of tubercles (size of mustard seeds) in the lungs, and tuberculous enlargement of the bronchial, mediastinal, and tracheal lymphatic glands. The other groups of lympathic glands, as well as the liver, spleen, kidneys, and muscular tissue, appeared normal, but microscopic examination revealed the presence of a few minute tubercles in the liver and spleen.

Blood.—On the day following that on which the injection of tubercle bacilli into the jugular vein was made, 6 c.c. of blood were withdrawn from the same vessel (left jugular) by means of a sterile hypodermic syringe. Three c.c. of this were injected into the peritoneum of each of two rabbits (A and B).

Rabbit A was found dead on the forty-fourth day after inoculation. The *post-mortem* examination revealed the peritoneum normal and no trace of tuberculosis anywhere. The animal was emaciated, and the intestine contained numerous coccidia.

Rabbit B was killed on the sixty-ninth day after inoculation. The *post-mortem* examination showed the peritoneum, lymphatic glands, and thoracic and abdominal organs normal in appearance.

A rabbit (C) was inoculated intraperitoneally with 10 c.c., and a guinea-pig subcutaneously with 5 c.c., of defibrinated blood taken from the jugular vein of the cow immediately after death (by

chloroform). This was on the twenty-third day after the cow had been inoculated intravenously. The blood was taken with the strictest antiseptic precautions, the instruments and vessel having been sterilised by boiling, while the bunch of wires used in defibrination was heated in the flame of a Bunsen burner.

Rabbit C was killed on the forty-seventh day after inoculation, and the *post-mortem* examination revealed no trace of tuberculosis in any part of its body. The above guinea-pig was killed on the one hundred and fourth day after inoculation, and the *post-mortem* examination revealed the following. At the seat of inoculation (between the scapulæ) there was an ulcerating sore from which thick caseous pus was discharging. On both sides the axillary lymphatic glands were enlarged to the size of a haricot bean, and caseous. Numerous tubercles existed in the lungs and liver and a few in the spleen. Tubercle bacilli were easily discovered in these lesions.

Muscle.—5 grammes of muscular tissue taken from the internal muscles of the thigh of the cow with sterile instruments were pounded in a sterile mortar with 10 c.c. of bouillon, and of the turbid liquid thus obtained 1½ c.c. was injected under the skin on the right side of the abdomen in each of two guinea-pigs (A and B).

Guinea-pig A was killed on the forty-seventh day after inoculation. The precrural lymphatic gland on the right side was enlarged to the size of a horse bean, and softened centrally, while the inguinal gland on the same side was slightly enlarged, and a few small tubercles were present in the spleen.

Guinea-pig B was killed on the one hundred and fifth day after inoculation. The skin at the seat of inoculation was intact, but under it there was a small caseous nodule. The precrural lymphatic gland on the same side (right) was as large as a horse bean and caseous. The spleen and liver were much enlarged and full of tubercles. Tubercles were more sparingly present in the lungs.

Popliteal lymphatic gland.—The left popliteal lymphatic gland of the cow was seared on its outside and then torn open with sterile instruments. The tissue of the interior of the gland was then scraped with a sterile knife, and the scraping was suspended in 10 c.c. of bouillon. Two guinea-pigs (A and B) were inoculated subcutaneously on the abdomen with the turbid liquid, one (A) receiving 2 c.c., and the other 3 c.c.

Guinea-pig A was killed on the forty-seventh day after inoculation. There was a caseating lesion in the texture of the abdominal wall. The precrural and axillary lymphatic glands on the same side were much enlarged and caseous. The corresponding glands on the opposite side were slightly enlarged and commencing to caseate. The spleen contained numerous tubercles, and the liver and lungs a few.

Guinea-pig B was found dead on the ninety-ninth day after inoculation, with an ulcerating sore at the seat of inoculation on the abdominal wall, the precrural glands on both sides enlarged and caseous, and tubercles in the spleen, liver, and lungs.

In the second series of experiments the apparently healthy parts tested by experimental inoculation were muscular tissue,

the spleen, and a lymphatic gland imbedded between the muscles of one of the hind legs. The experiments proved that the lymphatic gland and the spleen contained living tubercle bacilli, but those made with the muscular tissue had a negative result.

In the third series the experiments proved that the apparently healthy liver and a lymphatic gland from one of the hind legs were infective, but those made with blood, spleen, kidney, and a lymphatic gland from a fore limb had a negative result.

In the fourth series of experiments only the muscular tissue and the spleen were tested, the result being positive in the case of the latter, and negative in the former.

The result of the experiments is important mainly as emphasising the impossibility of judging of the safety of a carcass for human food when an opportunity is not afforded to examine the internal organs, notably the lungs. In each of the four carcasses tested, apparently healthy parts were found to contain living virulent tubercle bacilli, and, notwithstanding this, at least two of the four carcasses would probably have been passed in any slaughter-house had they been presented for inspection after removal of the internal organs.

TUBERCULIN.

During the past year the results of the tuberculin test on an aggregate of 3,270 cattle were communicated to the Laboratory by members of the veterinary profession, and out of that number 963, or 29 per cent., reacted. In the annual report for the previous year particulars were given regarding the result of the test on 1,109 animals, of which 426, or 38·4 per cent, reacted. The smaller percentage of reactions during 1898 is probably in part ascribable to the fact that a larger proportion of the animals tested were young stock and bulls, and that the figures include some second tests of presumably healthy animals that did not react on the first occasion. When the figures for the two years are added the total number of animals tested is 4,379, of which 1,389, or 31·7 per cent., reacted. The animals tested during the past year belonged to about one hundred different herds, and the figures were furnished by forty veterinary surgeons, practising in various parts of England and Scotland. The great majority of the animals tested were cows.

During the past year a great many inquiries have been addressed to the Laboratory regarding the reliability and safety of the tuberculin test. "Is the test infallible?" was one of the questions frequently asked. If the answer has to be monosyllabic it must be, "No." No agent in human hands can be said to be infallible for any purpose, and although with the exercise of proper precautions the tuberculin test is very reliable, it is not absolutely free from the chance of error, as the following considerations will show.

In the first place, tuberculin is not a substance of definite chemical composition and strength. It is obtained by cultivating tubercle bacilli in an artificial nutrient liquid, and its efficacy as a test depends upon certain substances of ill-defined chemical

composition which are added to the liquid by the vital activity of the bacilli growing in it. As regards their mode of origin, these substances may be likened to the alcohol which is formed in a saccharine solution in which one of the yeasts is cultivated. Tuberculin would be termed weak or strong according to its richness in these substances, and it is a test for tuberculosis because a quantity of it which produces no appreciable effect on a non-tuberculous animal excites a short but sharp attack of fever, manifested mainly by a rise of temperature, in one that is tuberculous. But by using a sufficiently large quantity of tuberculin one may cause the temperature to rise in an animal that is free from tuberculosis, and by using too small a dose of tuberculin, or a tuberculin that from some error in its manufacture is too weak, one may fail to cause an elevation of temperature even in a tuberculous animal.

These facts alone may appear to carry with them serious chances of error, but as a matter of fact the risks of miscarriage which they involve are inconsiderable, provided the tuberculin is obtained from some reliable source, for there is already a large experience to guide those who manufacture it as to the proper dose, and there is fortunately a wide margin between the quantity that will excite a reaction in a tuberculous animal and the quantity that will cause the temperature to rise in a healthy one.

Another possibility of error arises from the fact that one has to measure the reaction to tuberculin by the elevation of the animal's temperature during the 15 or 18 hours after the injection of the substance, and that during this period the temperature may rise from some cause quite unconnected with the injection of tuberculin. This, again, may at first sight appear to provide serious risk of errors in diagnosis, but there is a circumstance which reduces it to very small proportions, viz. the fact that the reaction to tuberculin is measured not entirely by the *amount* of the elevation of temperature, but also by the *manner* in which the temperature ascends. The normal temperature of the ox is from 101° to 102° F., and when a tuberculous animal of that species is tested with tuberculin its temperature begins to ascend a few hours afterwards, and *gradually* rises two, three or four degrees, the maximum point being reached about the 12th or 15th hour, after which it gradually falls again to the normal. Every rise which has this character must be taken as an indication that the animal is tuberculous, but sudden ascents of temperature followed by sudden falls to the normal must be set down to some accidental disturbance. The subjoined temperatures of two animals under the test will make this plain, the first showing the gradual ascent of a tuberculous animal, and the second an erratic rise determined by an accidental disturbance.

No.	Time of injection	3 hours	6 hours	9 hours	12 hours	15 hours
1	101·8°	102·4°	103·4°	106·6°	105·8°	105·2°
2	102°	101·6°	102·2°	101·7°	101·7°	105·8°

It will thus be seen that one is able to recognise a good many accidental rises of temperature in animals under the test, and thereby to avoid the mistake of classing the animals in question as tuberculous, but it must be confessed that no amount of care can altogether evade the chances of error from this cause, and in certain circumstances these become very considerable. This is notably the case in animals that have been exposed before or during the test to excitement, such as is occasioned by transporting them to strange surroundings. On this account it has already been abundantly proved that the test is not to be relied upon when carried out on cattle in a market or slaughter-house. Wherever possible, cattle should be tested in their own premises, and if they have experienced a change of quarters the operation ought to be postponed until observation with the thermometer has shown that the temperature has become quite normal and steady. The complaints regarding uncertainty and errors in the application of the test to valuable animals sold for export are probably ascribable to neglect of this very necessary precaution.

The foregoing are possibilities of error in the direction of diagnosing tuberculosis in healthy animals, which is probably regarded by many people as the most objectionable mistake that can be made in carrying out the tuberculin test, but there is also a chance of error of the opposite kind, that is to say, of passing a tuberculous animal as healthy. Obviously this is a very unfortunate mistake to make, for it may lead to the introduction of the disease into a previously healthy herd, or it may nullify the sacrifice which an owner has made in disposing of all the animals that have reacted, with the object of eradicating the disease from his stock.

Mistakes of this kind probably sometimes arise from an oversight in performing the operation, part or the whole of the dose of tuberculin escaping between the hypodermic needle and the nozzle of the syringe, perhaps owing to some sudden movement of the animal at the moment of injection. Obviously, with the exercise of proper care, this ought to be a very rare accident. There is, however, one chance of error in this direction which is less easily avoided. It appears to be a very well established fact that an animal with actual tuberculous lesions in it will react to tuberculin, but between the moment of infection and the formation of actual lesions in the part to which the bacilli have gained access —the lungs for example—a certain time must elapse. Infection with the bacilli, whether by inhalation or ingestion, may be momentary, but it is not credible that an animal infected in the forenoon would react in the afternoon of the same day. The period of time that must elapse after infection before a reaction can be obtained is as yet undetermined, and possibly it varies according to the method of infection. The point is one of considerable importance, and it was deemed advisable to make the following experiments bearing on it. A steer which gave no reaction to tuberculin was infected by the injection of living virulent tubercle bacilli into one of its veins. Nine days afterwards, when tested

with tuberculin, its temperature gradually rose from 101·4° until at the 12th hour it had reached 105·3°, after which it gradually declined. A heifer which did not react was infected in the same manner, and when re-tested eight days afterwards it displayed a typical reaction, the temperature rising gradually to 105°. The test was repeated ten days later, and with a similar result.

It ought to be observed that in these cases a large number of bacilli were used to infect the animals, and it probably would not be safe to conclude that a reaction would be obtained as soon after natural infection by the inhalation of a few bacilli. To counteract this source of error it is advisable, when an attempt is being made to weed the disease out of a herd, to re-test those which have not reacted on the first occasion after an interval of not more than three months.

Lastly, among the possible errors that may be made in using tuberculin, there must be included the occasional failure to elicit a distinct reaction in animals which are emaciated and near the point of death from tuberculosis. This, however, cannot be considered a serious defect in the use of tuberculin, for such failures are only met with in animals that are worthless, and whose tuberculous condition is almost obvious.

It will be seen from the foregoing considerations that the tuberculin test is not one in which the possibility of error is absolutely excluded, but when the sources of error are known beforehand they may be guarded against, and a most trustworthy indication as to the existence or non-existence of tuberculous disease in the animal tested may be obtained.

SWINE FEVER.

The returns of the Board of Agriculture show that in spite of the efforts made to stamp out swine fever, the disease was rather more prevalent during 1898 than during the preceding year, the number of outbreaks for the two periods having been 2,514 and 2,155 respectively. The operations of the Board involved the slaughter of 43,756 pigs in 1898 and 40,432 in 1897.

As the regulations of the Board require the viscera of pigs suspected of swine fever to be forwarded to the offices of the Board, very few examples of the disease are now sent to the Research Laboratory. During the past year recourse was had to the Laboratory for advice and assistance in two cases in which pigs continued to die from swine disease, which after investigation at the instance of the Board of Agriculture had been declared not swine fever. In both of these cases the examination of the parts sent to the Laboratory left no room for doubt that the disease was swine fever. In one of these instances the outbreak occurred on the Society's Experimental Farm, and particular interest attaches to this case because of the lesions present in the pig which was forwarded to the laboratory. This animal had a number of quite typical swine fever ulcers on the lining membrane of the large intestine, and its

lungs were also extensively diseased. The association of lung lesions with ulceration of the bowel is not rare in swine fever, but with very few exceptions the lung disease is a mere accidental complication, determined by bacteria that are quite distinct from the bacillus of swine fever. In this case, however, the lung lesions were of a very exceptional character, and were thus described in the note made at the time :

"Both lungs are partially adherent to the chest-wall, and each is extensively solidified. In the case of the left lung the anterior third is quite solid, and on section the solid part appears to be in a condition of necrosis (death), its colour being for the most part dirty white, at some places yellowish white. In the posterior and lower part of the same lung there are other areas of the same appearance, some being almost confluent, and others, up to the size of a hazel-nut, embedded in spongy lung tissue. The right lung is in an almost identical condition, but the necrosis is rather more extensive. The bronchial glands are much enlarged, abnormally firm, and greyish-white on section."

A microscopic examination showed that the diseased portions of lung contained great numbers of small bacilli completely agreeing in size and form with those of swine fever, and apparently unmixed with any other organism. Culture experiments made from the same parts yielded a perfectly pure growth of swine fever bacilli, identified by the characteristic appearance of the cultures in gelatine-agar.[1]

This observation shows that the pig may be the subject of a genuine swine-fever pneumonia, and that in such a case the lung lesion takes a form essentially the same as that determined by the swine fever bacillus when it grows in the wall of the bowel, viz. a necrosis or death of the invaded tissue.

The Contagious Origin of Warts.

Papillomatous tumours of the mucous membranes, or warts, as they are commonly termed, are frequently met with in several of the domestic species, but the animal in which they most commonly occur is the dog. In that animal their most frequent seat of development is the lining membrane of the mouth, and in some instances almost the entire cheeks, tongue, lips, and palate are thickly studded with them.

During the past year two young fox-hounds thus affected were admitted to the college infirmary, with a history which suggested that the condition was due to contagion.[2] It therefore appeared to be desirable to put the matter to the test of experiment by attempting to transmit the disease by inoculation. A number of

[1] First described in the Annual Report for 1895, vol. vii. p. 113 of this Journal.

[2] The clinical history of these cases has been since recorded by Professor Penberthy in the *Journal of Comparative Pathology and Therapeutics* (vol. xi. part 4).

experiments (carried out in association with Professor Hobday) were made with this object, and the results prove that the common papilloma of the dog's mouth is transmissible by inoculation, and they support the clinical evidence in favour of contagion being the common cause of such growths. They also show that without any treatment whatever such papillomata may disappear by a process of gradual shrinking and absorption, and they suggest that the credit claimed for some methods of treatment may be undeserved.

Lastly, the experiments indicate, though, owing to their small number, they cannot be said to prove, that after disappearance of a first crop of papillomata the animal is left in a measure protected against a second infection of the same kind.

Milk Fever.

The disease which is known as milk fever, parturient paralysis, or dropping after calving, has a very obscure pathology, although the circumstances in which it occurs are very well known. It must also be confessed that it is a very fatal disease, and although in this country several different methods of treatment have been warmly recommended, the mortality has always remained high when calculated on the results obtained in a large number of cases treated by different veterinary surgeons. In consequence of this comparative failure of remedial measures a good many owners have adopted the practice of simply having every cow attacked with milk fever slaughtered for butchers' purposes as soon as the animal loses consciousness. It therefore appears to be desirable to call attention here to a new method of treatment, which, it seems impossible to doubt, leaves every other far behind in point of success.

The new method of treatment was first practised by Schmidt, a Danish veterinary surgeon, who was led to employ it tentatively because of his conception of the nature of the disease. He believed that the symptoms of milk fever are the result of the absorption into the general circulation of a poisonous substance which is formed within the udder itself during the first few days of lactation, the source of this poison being the cells which, prior to calving, occupy the ultimate recesses of the mammary gland, and which are normally cast off and passed out with the milk first secreted. The primary seat of the disease being, according to this conception, the udder itself, it occurred to Schmidt to try the effect of treatment which would immediately influence the secreting epithelium of the gland. With this object he injected a warm solution of iodide of potassium in water into each of the quarters (previously milked), and then kneaded and rubbed the udder in order to force the liquid into the ultimate glandular recesses. At the date of publication of his original paper on the subject,[1] Schmidt had applied this treatment to fifty cases of milk fever, and had obtained 46 recoveries. Since

[1] *Monatshefte für praktische Thierheilkunde*, vol. ix., parts 7 and 8.

then the treatment has had an extensive trial in Denmark, with results almost as gratifying as those obtained by Schmidt himself. Moreover, the method has already been employed in a good many cases in Germany and this country, with results that appear to be much more satisfactory than those previously obtained by other methods.

As in the case of most other therapeutic efforts, it is very important that the treatment should be begun early, but it is admitted that death has resulted in cases of milk fever treated by Schmidt's method even within 12 hours after the onset of the attack. It may perhaps be reckoned a defect in the method that it is hardly one which the layman can take in hand, since it demands special instruments and great care that these and the liquid injected into the udder are free from bacteria, the introduction of which would be very apt to set up inflammation of the gland. When proper care is taken there are no serious after-effects, the milk secretion soon becoming normal in quantity and quality. Should further experience of Schmidt's treatment justify the high opinion of it generally entertained by those who have already tried it, a rather serious source of loss to those engaged in milk production will have been in great measure removed.

J. McFadyean.

Royal Veterinary College, London.

Notes, Communications, and Reviews.

FATTENING AND MARKETING OF POULTRY.

THE POULTRY INDUSTRY IN THE EAST RIDING OF YORKSHIRE.

IN the year 1896 I visited upwards of ninety farmers and others who keep poultry in the neighbourhood of Malton. The area covered was about twelve square miles, and within this space there were two farms on which upwards of 300 hens were kept, thirteen farms with 200 or more, twenty-eight farms with 100 or more, fourteen farms with 50 or more, and about forty people who kept less than 50. From amongst these there was not one who could give me the smallest idea either of the cost or of the quantity of food consumed, and only one who knew the number of eggs sold and the price they realised.

The total number of hens amounted to 9,508, probably giving a gross return of about 5*s.* per hen, or a total of 2,377*l.* Under favourable conditions the return per hen should be 10*s.*, whilst in exceptional cases as much as 12*s.* and even 15*s.* has been obtained from individual birds of exceptional merit. There are a number of causes to account for this wide difference, and a number of obstacles to be overcome before a better result can be hoped for. The remedy is to a very large extent entirely outside the means of individual enterprise, but I am convinced that a number of people working together in a systematic manner could not only raise the average returns from poultry keeping, but also produce results far in advance of anything at present obtainable. The causes immediately producing the present defects in poultry keeping are :—

1. Deterioration in the productive powers of the various breeds, resulting from the aims of the fancier being in direct opposition to the requirements of the economic production of eggs and table fowls.
2. The predominance of inferior breeds among the farmer's stock, owing to the knowledge of the respective merits of breeds being deficient.
3. Care and want of discrimination in breeding, and the retention of hens to too great an age.
4. Defects in general management, feeding, &c.
5. Defects in the system of marketing.

In answer to my question, Do poultry pay ? I was invariably

told that the women folk liked them and considered the profit as their perquisite. The chickens sold during the year in the above area only amounted to about 3,400, the practice on most farms being to rear as few chickens as possible, as prices are considered unremunerative, and the dealers say that the supply exceeds the demand, as they can always obtain Irish chickens. On the other hand, eggs are always in demand, so much so that a great many farmers refuse to sell their eggs to anybody except the dealer who takes their butter, and it is a significant fact that the dealer often refuses to buy butter unless eggs may be had as well. On every side I was told that poultry keeping was coming more into vogue, and that there was a decided increase both in the number of poultry keepers as well as in the quantity of poultry kept. Farmers, dealers, and shopkeepers all confirmed this statement, and they maintained that this increase also produced a corresponding fall in prices, but the following table, which I prepared from the weekly quotations in the *Malton Messenger*, does not during the last ten years show any striking variation :—

Table showing the Average Weekly Expenditure required in the Purchase of One Dozen Eggs and One Chicken of medium size and quality, in the several undermentioned markets, in 1887 *and in* 1897.

Market	One dozen eggs				One chicken			
	1887		1897		1887		1897	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Leeds	1	$0\frac{1}{2}$	1	1	—		—	
Thirsk	0	$11\frac{3}{4}$	1	$0\frac{1}{2}$	2	$3\frac{3}{4}$	2	$2\frac{3}{4}$
Malton	0	$10\frac{1}{2}$	0	$10\frac{1}{4}$	2	$1\frac{1}{2}$	2	$2\frac{1}{4}$
Kirbymoorside . . .	0	$10\frac{1}{4}$	0	10	1	$11\frac{1}{2}$	1	$11\frac{1}{4}$
Pickering	—		0	10	—		2	$1\frac{1}{2}$

As a matter of fact 1*s.* 6*d.* is the lowest, and 2*s.* 9*d.* the highest price quoted for chickens in any of these markets. Eggs vary from seven to twenty-one for 1*s.* On outlying farms and small holdings where the occupier does not consider it worth his while to go to market, the eggs are usually called for and bought by a passing carrier. I am able to give an instance of the average price actually paid by such a carrier in 1896, taken from a farmer's account book, the average rate for the year being 9½*d.* per dozen. If we include this in the above table we see that a farmer at Thirsk receives as much as 25 per cent. more for his eggs than a farmer living within thirty miles of him. It must not be supposed, however, that this farmer received 9½*d.* per dozen for the eggs he marketed, as it must be remembered that he obtained by far the larger number when eggs were selling at from fifteen to twenty-one for 1*s.* He sold 9,447 eggs in the year, realising a total of 27*l.* 7*s.* 4*d.*, which is equal to between 17 and 18 for 1*s.* or about 8*d.* per dozen.

In outlying districts the carrier calls for eggs once a fortnight,

while those taken to market by the farmer arrive once a week. The dealers complain bitterly of the inequality in the size of the eggs, and the filthy state in which they are delivered. They say their chief difficulty is to guard against stale eggs when prices are rising, the farmer keeping them a considerable time and then bringing them as *fresh*-laid. A man actually informed me that he frequently sent eggs three weeks old to a shop in York by the traveller calling for orders, who took them without asking any questions. A shopkeeper told me that he did not care what eggs I sent in so long as they were saleable; they might be kept as long as I wished, provided I used a means of preserving them by which they would appear fresh, and would produce no complaints from his customers. The public want fresh eggs, but they have given up all hope of procuring them, for if they leave one tradesman they know perfectly well they run little better chance with another; they therefore refuse to pay an exorbitant price for a doubtful article. For instance, a lady in York told me that she obtained eggs from a farm in Cornwall twice a week because she could rely upon their being fresh. I myself have seen eggs costing 2*d*. and even 3*d*. each which have been quite musty, but whether caused by the hens being fed on unsuitable food, or by uncleanliness, or by being kept too long, does not affect a disgusted public.

A village policeman having told me that he derived considerable satisfaction from his poultry, having plenty of spare time when off duty to attend to them, I went to see them at the end of January, and what I saw certainly was, in the neighbourhood of Malton, a very exceptional sight. The pigsty, instead of its usual occupant, contained some half-dozen hens in boxes, with a board over them. Each box contained thirteen eggs, most of which were shortly due to hatch. In the same house was a hen with a dozen healthy young chicks, scratching in the sand covering the floor. The whole place was beautifully clean, and ready for some more sitting hens as soon as the man was able to procure them. He afterwards told me that his net profit on poultry for the year amounted to 5*l*., though the price he received for his chickens was very low.

The following is a good illustration of what a farmer can accomplish. The accounts were very carefully kept, and the farmer, whom I will call Mr. X., allowed me to go through them at my leisure. The size of the farm is about 200 acres, about one-half of which is grass. Eggs are sold to shops and private customers, also a few for setting at from 2*s*. to 4*s*. per dozen. When the market price is less than one shilling for 18, the eggs are laid down in lime and sold in winter; those used in the house were valued at $\frac{3}{4}$*d*. each. The whole of the labour, feeding, marketing, &c., is done by Mr. X., his wife, and daughter, and is not charged for, but he reckons their combined efforts bring in from 60*l*. to 80*l*. per annum, which goes a considerable way towards paying his rent. The following is a statement of the food consumed by poultry in the year:—

		£	s.	d.
Barleys	1,241 stones	52	6	1
" meal	124 "	5	17	4
Oats	82 "	3	8	4
Oatmeal	20 "	1	18	0
Wheat	66 "	2	15	0
" meal		0	15	0
Maize	99 "	3	12	0
Rice		3	9	0
Spice, Spratt's food, peas, mustard, sulphur, and hemp		4	3	9
Bill for grinding at mill		8	18	7
Sundries		1	6	3
		£88	9	4

The eggs laid in the year numbered 20,185. It is unfortunate that hens and chickens should be included in one item in the inventory; but 200 is about the number of hens Mr. X. usually keeps.

Inventory and Valuation.

January 1, 1894. Description of stock on hand	Number	@ s. d.	Value £ s. d.	January 1, 1895. Description of stock on hand	Number	@ s. d.	Value £ s. d.
Fowls	280	2 0	28 0 0	Fowls	292	2 0	29 4 0
Ducks	16	—	1 12 0	Ducks	22	2 6	2 15 0
Geese	7	7 6	2 12 6	Geese	7	10 0	3 10 0
Turkeys	3	—	1 2 6	Turkeys	7	10 0	3 10 0
Portable houses	—	—	1 0 0	Portable houses	—	—	1 0 0
Poultry, owing for	—	—	2 14 0	Poultry, owing for	—	—	4 3 6
			£37 1 0				£44 2 6

Summary of the Year and Balance Sheet.

Dr.	£ s. d.	*Cr.*	£ s. d.
Valuation at commencement of the year	37 1 0	By amount received for eggs	92 15 8
Amount paid for fowls	13 5 6	Ditto for fowls	69 7 6
" " eggs	14 0 2½	Ditto for chickens	20 0 0
" " food	88 9 4	Feathers and manure	—
Labour and sundries	2 15 3	Eggs used in house	6 4 9
Balance	83 19 8	Fowls used in house	7 0 6
		Valuation at end of year	44 2 6
	£239 10 11		£239 10 11

Mr. X. certainly found a good market for his produce. I calculate that if all the eggs had been sold in the local market they

would probably have realised from 16*l*. to 20*l*. less than the sum he actually received for them. This was partly on account of some being sold in the spring for setting, and partly because Mr. X. is known to collect his eggs regularly twice a day, and, in general, takes every care to ensure their freshness. He can find plenty of customers anxious to take them who are willing to pay a good price. I find the custom in the neighbourhood is to collect eggs at most once a day, and on Sundays they are frequently not collected at all; it is a common occurrence to see as many as six eggs in one nest box. The hens set in the year included 9 in January, 18 in February, 24 in March, and 26 in April; a large proportion of the eggs set were purchased. A great many farmers do not attempt to set any hens before the middle of March. Nothing is charged for rent of land or manure. Mr. X. is confident that the benefit to the land and crops far exceeds any damage that may be done to his grass land, and firmly believes that his fowls, by picking up weed seeds and insects, both help to keep his land clean and his crops free from the ravages of insect pests, as well as providing themselves with a lot of food which would be wasted if the fowls were confined to the stack yard. The manurial value of 88*l*. worth of grain consumed amounts to no small sum, and as the fowls were kept in movable houses away from the buildings, and these were frequently moved, the waste is reduced to a minimum.

Leeds is one of the largest poultry markets in the north of England. Both Scarborough and York obtain a large proportion of their supply therefrom, while much of the poultry sold in Malton is taken to Leeds and Bradford. A fowl bought in a Scarborough shop may in this way have gone through a number of different hands, and cost a considerable amount in railway carriage. The cost might be estimated in the following way:—

	s.	*d.*
Value of a chicken in Malton market, say	2	0
Proportion of dealer's expenses to and from Leeds, and allowance for profit, say	0	3½
Carriage to Leeds *viâ* York, at 2*s*. per cwt., live poultry	0	1½
Leeds poulterer, allow profit and expenses, say . .	0	3
Carriage from Leeds to Scarborough, *via* York and Malton	0	2
Scarborough retail poulterer's profit, say . . .	0	4
	3	2

This, however, is not quite the case, as the chickens sent to Scarborough from Leeds are probably Irish, their value in Leeds being about 1*s*. 6*d*. or 1*s*. 8*d*. I am told that one large hotel contracts for all its chickens at 3*s*. 9*d*. per couple, for the months of July, August, and September, the contract being with a Leeds firm. The quality of the poultry sold by poulterers in towns like York is governed by the current prices in the larger and wealthier towns such as Manchester. Thus a York poulterer buying a quantity of

chickens sends the best away, disposing of the refuse at home, as his customers are unwilling to pay a sufficient price to leave him what he considers a fair margin for profit on the better class of poultry.

Poultry Fattening at Birdsall, Yorks.

The fattening of poultry has for years been resorted to with the greatest success, not only on the Continent, but also in this country, to a limited extent, the practice being confined to Surrey, Sussex, and Kent, though I believe the industry has recently been extended to Ireland and Lincolnshire. So far as I am aware, Birdsall, if not the first place in Yorkshire, is at any rate one of the very few places in this county where systematic fattening has been adopted, and it came about in the following way.

Lord Middleton employed a man to do nothing but look after the poultry on his extensive home-farm, but the results could hardly be considered satisfactory, as the chickens were tough, and the supply both of table poultry and eggs were insufficient for the needs of Birdsall House. I was at the time studying estate management with Lord Middleton's agent, Mr. Parsons, and my desire to learn for myself what poultry were capable of was fully gratified when Lord Middleton kindly put the poultry under my charge. The first consideration, of course, was to see that the house was regularly supplied both with fresh eggs and with table poultry of high quality. It was not easy to find a good poultryman, but I eventually obtained a man who has acquired considerable knowledge in "cramming," who excels in the art of trussing, and who ought to be a judge of a fowl from the fact that he has served with Messrs. Brooke Bros., in Leadenhall Market, and, lastly, one who is accustomed to attending to young chickens, setting hens, and managing an incubator.

After the arrival of the new poultryman I immediately set to work to clear off the entire stock of poultry which was on the farm, as these were without exception in a very diseased condition—many of the hens were dying of old age, the cocks were as bad as the hens, and throughout fresh blood was essential. I then thoroughly disinfected all the houses and land, which was for some months kept clear of poultry. I bought several portable wooden houses, and eighteen pure-bred hens and two cocks to provide eggs for setting the following spring, and from the fowls bought for cramming I managed to obtain a number of useful pullets which were kept for laying. The majority of the chickens fattened are bought from the farmers in the neighbourhood, the cages used being constructed on the Sussex principle but of stronger make; they consist of four compartments, each compartment containing four or five birds. The cost of material and labour for those made on the estate was about 5*s.* for each cage.

Last year I spent a very considerable amount of time in trying to find out something of the requirements of birds in the process of fattening. With this object I personally attended to the feeding of

upwards of a hundred chickens during the entire process of fattening. Unfortunately, owing to the birds being of various breeds, it was impossible to arrive at any reliable results as regards comparison of various foods, &c. The experiments, however, clearly demonstrate the variable powers of individual birds.

Table showing the Results obtained from 16 *Cockerels fattened at Birdsall.*

Description of fowl	Weight, April 5, 1898	Increase in weight			
		First week	Second week	Third week, cramming	Total increase
	lb. oz.	oz.	oz.	lb. oz.	lb. oz.
CAGE I.					
Plymouth Rock, white legs	4 4¾	7½	3½	0 12½	1 7½
Dorking	5 2	9½	6¾	0 11	1 11¼
Dorking cross	3 11	9¼	2¾	0 8	1 4
Game cross, yellow legs	4 11	9¾	6	0 9¾	1 9½
CAGE II.					
Dorking cross	4 4½	8½	3¼	0 7	1 2¾
Dorking	4 8½	6¼	2¾	0 11½	1 4½
Wyandotte	3 15¼	7¾	1¾	0 15¼	1 8¾
Dorking cross, black legs	3 11¾	Unsatisfactory, removed April 7			
CAGE III.					
Plymouth Rock	5 3½	14¾	6¾	1 3½	2 9
Mongrel, feathered legs	3 11¼	8¾	0½	0 2	0 6¼
Game, Andalusian cross	3 14¾	Unsatisfactory, removed April 7			
White, white legs	4 5	12	4¾	0 5¾	1 7½
CAGE IV.					
Indian Game cross	4 6½	8	0½	0 10¾	1 2¼
White Leghorn	4 4	9½	2	0 8½	1 4
Plymouth Rock, white legs	4 6¼	3¾	7¼	0 8	0 4½
Silver Wyandotte, yellow legs	4 9¾	10¾	8¼	0 7¼	1 10¼

Table showing the Results obtained from 32 *Pullets fattened at Birdsall in April* 1898.

Average of	Fasted live-weight at commencement	Fasted live-weight at end of three weeks	Increase in live-weight in three weeks	Percentage increase in three weeks
	lb. oz.	lb. oz.	lb. oz.	per cent.
13 birds	3 3	4 12½	1 9½	50·0
11 „	3 10½	4 13	1 2½	31·6
6 „	4 0	4 10	0 10	15·7

The remaining two birds not being satisfactory were removed before the end of the experiment. One, a Leghorn cross, lost 11 oz. the first week, the other gained 7 oz. in the first fortnight, and was then killed.

The best result was obtained from a pure Orpington, weighing at

the commencement 3 lb. $12\frac{1}{2}$ oz., which in the three weeks increased 2 lb. $1\frac{3}{4}$ oz., or 56 per cent.

Mr. C. E. Brooke, who is one of the most successful exhibitors in the table poultry classes at our shows, gives the results obtained from twenty-four chickens fattened at his poultry-fattening establishment as follows:—Average weight at commencement, 5 lb.; increase, at the end of three weeks' fattening, 2 lb. 4 oz., or 45 per cent.

The value of the above thirty chickens when put up to fatten was, at 2*s.* 3*d.* each, 3*l.* 7*s.* 6*d.*, or $7\frac{3}{4}$*d.* per lb., and I reckon the theoretical increase in their value as follows:—

	£	*s.*	*d.*
Increase on fattening 40 lb. 10 oz. at $7\frac{3}{4}$*d.* per lb. . .	1	6	2
,, in quality 146 lb. at 1*d.* per lb. . . .	0	12	2
	1	18	4
Less net loss on two birds unsatisfactory . . .	0	3	0
	£1	15	4

This estimate shows the average value per chicken to be 3*s.* 5*d.*, and leaves a margin of 1*s.* 2*d.* per head to cover cost of fattening and profit.

To obtain fine quality in poultry it is necessary that the fowls should be kept in the cages for three weeks; during any shorter period of treatment the influence of the soft food on the flesh has not sufficient time to exert its full effect. If, however, it were purely a matter of producing flesh at a minimum cost per lb., it would be more economical to keep the birds up for, say, a fortnight instead of three weeks, causing a saving both in labour and food, as it has been proved that the amount of food that will produce 1 lb. increase in a lean animal is less than that required in the case of a fat one, and the fatter the animal the greater the amount of food required to produce 1 lb. increase. Unless, therefore, the fattener can obtain a price in proportion to the quality as well as the weight of a fowl, the scientific fattening of poultry is unremunerative, but this will be more clearly seen when considering the question of fowls by weight.

The thirty-two birds referred to in the preceding table during the three weeks' fattening consumed:—

	s.	*d.*
188 lb. meal valued at 1*d.* per lb.	15	8
$7\frac{3}{4}$ lb fat	0	9
$7\frac{1}{4}$ gallons skim-milk	0	9
	17	2

Estimating the feeding value of 1 lb. of fat to be equivalent to that of 3 lb. of meal, it took rather under 6 lb. of meal (sharps and "Sussex ground oats") to produce 1 lb. increase in live weight. To arrive at this conclusion it was necessary to mix the meal and liquid

in definite proportions; for one period of the experiment the proportion by weight was 3 parts of meal to 5 of water, and for the remaining period 2 parts of meal to 3 of water.

The food used in fattening consists chiefly of a meal known as "Sussex ground oats," which is mixed with water and skim-milk. During the latter part of the process fat is also added, beginning with a little at first, and the amount being increased until a maximum is reached, and the birds are considered ready to kill. It is claimed that "Sussex ground oats" is the only meal that will produce really satisfactory results, and I believe I am right in saying that Messrs. Neve Bros. are the sole manufacturers. The price they charge me is 7*l.* per ton, carriage extra 2*l.* 5*s.* On my writing to them for a written guarantee of purity, they sent me the following answer:—

"We do not profess to sell the meal as pure ground oats, but as a fattening meal which is composed of oats, barley, and other nutritious and fattening constituents. We can assure you there is none of the grain extracted."

The fact is, that there is no species of grain which, when ground to a meal, is suitable for fattening fowls, because it is too concentrated and probably deficient in albuminoids owing to the removal of the husk. It must, however, be remembered that the normal temperature of the fowl's blood, 111° Fahr., is considerably higher than that of our other domesticated animals, such as the horse, ox, and sheep. "Sussex ground oats" seem to contain a very large proportion of husk, but this is very finely ground, and, I believe, also undergoes some process of baking, often causing the meal to be quite dark in colour.

I concocted a feeding mixture which, I argued, should to some extent prove satisfactory, being composed of sharps, oatmeal, barley meal, and very finely chopped hay containing only soft and young grass. The hay, I thought, would act in a similar way to the husk of cereals, but would be more easily digested by the fowls, and contain more nourishment. In mixing, the hay was first steamed for about twelve hours, so that it was quite soft when mixed with the meal. This mixture seemed to be much appreciated by the fowls, and was very much cheaper than "Sussex ground oats." The sixteen chickens fed on the mixture kept perfectly healthy, and at the end of a fortnight showed a greater increase than a similar number fed on "Sussex ground oats." This is merely mentioned here as an instance in support of my opinion that science is capable of promoting economy in the production of poultry to an extent certainly not less than in the case of other classes of farm live stock.

As great stress is generally laid on the importance of the skim-milk used in fattening being sour, I should mention that all the milk used in my experiments was perfectly sweet and fresh, it striking me as peculiar that rank sour food should be advantageous in fattening poultry, when in every other case, without exception, I believe fresh sweet food is considered of primary importance. What

effect has sour skim-milk on chickens in the fattening pens? It scours the birds, disposes them to pass an increased amount of food through their system, and causes the excreta to give off a frightful stench, especially when the food contains a large amount of fat. How much of this sour food is digested? Is the result obtained better than that from a bird eating a smaller amount of food, but that sweet instead of sour, and the excreta free from stench? At present the main object in cramming seems to be the passing of as much food as possible through the bird, little or no regard being paid to the bird's powers of digestion. I do not mean to say that the present system is incorrect, but I should like to see the soundness of the principle thoroughly tested. The increase in live weight does not of itself afford evidence of the fattener's skill, as a very large proportion of this increase is internal fat. If fattening be carried to excess in its early stages, that is, if more food be consumed by the bird than it is capable of converting into flesh, the excess will tend towards the formation of fat. Further, if the food is deficient in nitrogen, or flesh-forming matter, and the proportion of carbohydrates is excessive, a part varying according to the extent of the deficiency is not only wasted, but is even acting in opposition to the fattener's aims. The albuminoid ratio of feeding stuffs and their profitable utilisation is a subject of the utmost importance, and is a matter on which we must look to the chemist for advice and help. It may be said that what he has already accomplished in connection with the food required by cattle, sheep, &c., is applicable to poultry, and at the disposal of every intelligent poultry-keeper. This is, no doubt, the case to some extent, but the difference between the anatomy of a quadruped and of our feathered biped is sufficient to warrant special investigation on behalf of the latter.

Whatever defects in the chickens and the method of fattening there may be at Birdsall, it is certain that the birds have been much appreciated, judging from the many complimentary letters which I have received from various customers. One lady wrote, "Some friends unexpectedly came to luncheon, and we all seven lunched off one chicken, which was more than sufficient to satisfy all; it was quite equal to two from the poulterer here, only of far better quality." A caterer in York, in a large way of business, wrote: "I enclose cheque for 11*l.* for chickens, which I must say are the best I have ever had; please let me have the next 10 couple to be here on the 27th inst., and if you can supply more please let me know." At a shop in York they told me that though they supplied this same caterer with poultry they found it impossible to satisfy him, notwithstanding that their price was 2*s.* a couple less than mine.

I do not wish it to be inferred that a fattening establishment would prove a financial success if started by private enterprise in any district where the system is at present unknown. There are a great many things to be considered, and numerous obstacles to be overcome, and any premature attempt would probably end in failure, and perhaps prevent others from embarking upon the experiment under more favourable conditions. I know, however, that

it is practicable to adopt the system of fattening poultry throughout the country, and, further, that in time every district will contain a fattening establishment which will abolish the hard, scraggy fowl, which at present predominates in our shops, together with the present mode of marketing. This, I may add, is an echo of the opinion shared by a number of those best qualified to speak on the subject.

The Sale of Fowls by Weight.

"A flying or winged animal; a bird." This is the definition of a fowl as given in my dictionary, while a chicken is described as "the young of a bird, particularly of the hen." Correctly speaking, I suppose a chicken ought on arriving at maturity to be designated as a fowl; but no such distinction seems to be made. The following dialogue heard in a local market affords a good illustration of this:—Would-be buyer to dealer: "Have you got any chickens to sell?" On a dozen old hens being produced, for which 2*s.* 6*d.* each was asked, a bystander remarked, "What! Are those spring chickens?" "Yes," replied the dealer, "last spring, or maybe t' spring before, but spring chickens undoubtedly." On another occasion when I went into a shop and asked to see a good chicken, the poulterer wanted to know whether I required it for boiling or roasting; the one he strongly recommended for boiling was a fine old rooster with its spurs cut off. Yet another instance was that of the lady who wrote and asked me to send her two nice tender chickens; a day or two after I received an indignant letter from her, saying she certainly never intended to order "spring chickens," and would I in future send fowls, which was equivalent to saying that she required quantity rather than quality.

The value of a chicken in the country is governed by the local market price, that is to say, that 3*s.* is considered high, and anything above that exorbitant. "A fowl is a fowl, the price of a fowl is 2*s.* 6*d.*,"—this ridiculous statement met me at every turn, a misconception very difficult to correct. People who at first held the above opinion have since willingly paid in some cases as much as 5*s.* for a single chicken. I determined to show people that Birdsall-fattened chickens were to be sold at their full market value, and not at the price which contented the farmer, or, more correctly speaking, the price he is able to obtain. With this object in view I first wrote to the manager of a large hotel, who ordered sixty at 3*s.* each, and was well satisfied. He told me that, as a rule, he obtained all his poultry from London, either Surrey or Boston fowls, and that in the summer months he required an average of thirty per day. After sending him fowls on four or five occasions I had to stop the supply, as he refused to take any fowl with black legs, which, in his opinion, was of much greater importance than a mere question of age; so long as a fowl was large and contained sufficient fat for basting I was given to understand that he would be satisfied. In the same month (November 1897) I sent 140 chickens to a caterer at York for two ball suppers at the same

Table showing the Weight and Value per lb. of Fowls under various conditions, obtained from a variety of sources. In Trussed, Offal, and in the case of Flesh, Offal and Bone considered as Refuse.

No.	Description	Price of chicken	Weight: Dead weight [2]	Weight: Trussed [3]	Weight: Flesh [4]	Price per lb.: Dead weight	Price per lb.: Trussed	Price per lb.: Flesh
	Leadenhall Market	s. d.	lb. oz.	lb. oz.	lb. oz.	s. d.	s. d.	s. d.
1	Surrey . .	5 0	4 5	3 0	1 14	1 2	1 8	2 8
2	„ . .	4 0	3 12	2 4	1 8	1 0¾	1 9¼	2 9½
3	Boston . .	3 3	3 0	1 13	1 2½	1 1	1 9½	2 4¾
4	Russian .	1 6	2 3½	1 9	1 0¼	0 8	0 8¾	1 6
5	Birdsall .	3 7	5 0½	(3 6)	(2 5)	0 8¾	(1 0)	(1 6¾) [1]
6	„ .	4 9	5 1	(3 6)	(2 5)	0 11½	(1 6¾)	(2 0¾)
7	„ .	3 0	3 13½	(2 9)	(1 12)	0 9½	(1 2)	(1 10)
8	„ .	3 1½	3 4	(2 3)	(1 8)	0 11½	(1 5)	(2 1)
	Malton Market							
9	Large . .	2 6	5 13	3 10½	2 6	0 5½	0 8¼	1 0¾
10	Small . .	2 3	3 2	1 14	1 2¾	0 8	1 2½	1 8¾
	Poulterer at							
11	Malton . .	2 9	5 0½	3 2	1 14½	0 6¾	0 10½	1 5½
12	„ . .	2 9	3 2½	1 14	1 3	0 11	1 5½	2 3¾
13	York . .	3 0	—	2 9½	1 11	—	1 2	1 9¾
14	„ . .	2 6	—	1 12	1 0	—	1 5	2 6
15	„ . .	3 0	1 13	1 1½	0 10¾	1 8	2 4	4 5½
16	Birdsall .	3 0	3 9¼	2 7¼	1 9¼	0 10	1 2¾	1 9
17	„ .	3 3	7 1	4 11½	3 5½	0 5½	0 8¼	0 11½
18	„ .	3 0	4 11	3 1	2 1	0 9	0 10¾	1 4

[1] Figures in brackets are estimated.
[2] Dead and plucked.
[3] Trussed, less offal including feet.
[4] Including skin, being the amount a skilled hand was able to scrape off the carcass in the operation of boning.

Explanatory Notes to Table.

No. 1. The mean of two high quality Surrey fowls, kindly sent me by Mr. C. E. Brooke. March 31, 1898.

No. 2. Ditto, only smaller. April 20.

No. 3. Mean of two Boston or Lincolnshire fowls received from Mr. Brooke. April 20.

No. 4. Mean of two received from Mr. Brooke. April 20.

No. 5. Average of 24 chickens sent to Messrs. Brooke Bros. April 14.

No. 6. Ditto, 12 chickens. April 28.

No. 7. Ditto, 6 chickens.

No. 8. Ditto, 12 "spring chickens." May 25.

Nos. 9 and 10. Malton market. February 28.

No. 11. Picked out as the largest in the shop. March 18.

No. 12. Better quality than No. 11. Bought at same time.

Nos. 13 and 14. Picked out as the largest and smallest in the shop. March 15.

No. 15. Average of the two largest "spring chickens" in the shop. May 14.

Nos. 16, 17, and 18 are taken as examples of small, large, and medium sized chickens, showing the price I should have charged, or rather did charge, before I tried selling by weight.

price; his remarks on them are referred to on a previous page. The price received for some of the chickens sent to London markets is given in the table on p. 167, which was prepared with a view to better satisfy my customers, and give them some idea of the value of chickens of various qualities and obtained from various sources; this table formed part of a business circular I issued.

Looking at this table, it is seen that while the flesh of Birdsall-fattened chickens was being sold at 11½*d.* to 1*s.* 9*d.* per lb., flesh of very inferior quality was charged for at Malton and York shops at the rate of 1*s.* 5½*d.* to 2*s.* 6*d.* per lb.

One so-called spring chicken sent to Leadenhall Market contained rather more than double the amount of flesh contained in two unfattened chickens sold by a Malton poulterer; by comparison the value of the first one was at least 7*s.*, though in London it only sold for 3*s.* 1½*d.* This tends to show that though the price of a good chicken in Leadenhall Market is as much as 5*s.* or even 6*s.*, London is a better and a cheaper market. People in the country complain that they are unable to procure good poultry, which is due to the fact that they persist in refusing to pay a sufficient and, at the same time, a reasonable price for what they want. London is the only town in Great Britain that is regularly supplied with fattened chickens, and the demand exceeds the supply. I could give numerous examples of people in Yorkshire and elsewhere who send to London for all their poultry, simply because it is unobtainable elsewhere. Only recently I was shown the following London poulterer's bill and asked if the charge were reasonable:—

	£	*s.*	*d.*
December 23.—2 fowls at 5*s.* 6*d.*	0	11	0
Carriage	0	1	0
" 28.—8 fowls at 5*s.* 6*d.*	2	4	0
Carriage	0	2	9
	£2	18	9

The poulterer had written to say that he would be obliged to charge 6*s.* in future as fowls were getting dear. The price of a good fowl in the London market in December and January may be said to average from 3*s.* to 4*s.* 6*d.* according to size, though more in the case of exceptionally fine specimens. At the Royal Agricultural Society's Show in 1896 the demonstrations in table poultry were given by Mr. W. Bellamy, who expressed the opinion that fowls ought to be sold by weight, that the conscientious tradesman and the dealer in the best class of poultry would have nothing to fear from such a course, also that it would protect the purchaser and prevent him from being imposed upon.

"You buy your meat from the butcher by weight, and if you can afford it you buy the best and pay at a higher rate per lb. than you would if you went to an inferior butcher. You complain if he gives you too much bone or fat with your meat. If you are not well off

you do not buy a leg of lamb at Easter, but wait until it becomes more plentiful and therefore cheaper. In the case of chickens, if a poulterer offered to supply you at a certain price per lb. and you did not like the chickens, all you have to do is try another poulterer, and if he will give you better quality at the same rate you know you are receiving a cheaper article for your money. You would then soon see that when fowls were cheap you could afford the best; having learnt this, instead of buying an inferior fowl when prices were high, you would wait until the best came within your means. I am quite sure you would soon get tired of buying that questionable commodity called "a spring chicken," which is only a popular term for a chicken affording nothing but bones to pick, if only you realised that its flesh probably cost you upwards of 4*s*. per lb., which is considerably more than the rate you would pay for the best chicken procurable in London at any time of the year.

One of the first orders I got after the issue of my before-mentioned circular was for sixty chickens. My stock was rather low at the time, and it would have been extremely hard to have quoted any price, as they varied in size and quality to a considerable extent. I replied that I could supply the sixty chickens, but was afraid they were not of as good quality as usual, and some of them would be small. I felt confident, however, that they were as good as anything likely to be obtained in York, and from my enclosed circular I thought they would be cheap at 1*s*. 3*d*. per lb., the price asked, trussed and ready for cooking, but necks and livers not included unless ordered, when they would be charged for. I was in hopes that the chickens would average 3*s*. each, which would have quite satisfied me, and I was not far wrong. The sixty fowls weighed 151 lb., which at 1*s*. 3*d*. per lb. came to 9*l*. 7*s*. 6*d*., or 3*s*. 1½*d*. per bird. Some of these chickens I estimated to be worth 4*s*. each, but others not more than 2*s*. 6*d*. I am certain if I had asked 3*s*. each all round without stating weight and average value per lb., I should have been told that there were, say a dozen, not worth more than 2*s*. 6*d*., no reference being made to those worth 4*s*. In chickens as with almost everything else, a few small or inferior chickens among a good lot detract from the selling value of the whole parcel, and quite disproportionately to any actual deficiency. I sold necks and livers to the value of 11*s*., and gave the remainder away, as there were more than I was able to dispose of. There is no reason to doubt the honesty of a Leadenhall salesman, who trades on his good name, and wishes to afford his employer every facility for showing that his dealings are aboveboard. The sale of fowls by weight in the market would provide a check on the dealer, which is as much to his advantage as to that of his employer. It would also promote competition in the retail trade by affording the public a medium of comparison between the market and retail price. Instead of seeing the price of Surreys quoted in the morning paper at 4*s*. to 5*s*. each, English 2*s*. 3*d*. to 4*s*., it would read something like, Surreys 1*s*. to 1*s*. 2*d*. per lb., English 8*d*. to 1*s*., according to quality.

BYE-PRODUCTS FROM CHICKENS.

Chickens' feet.—From the feet and sinews of fifteen chickens I made three pints of jelly of the finest quality; a similar quantity made in the ordinary way would cost in material 2*s.*, and in a London shop would cost 3*s.* to 3*s.* 9*d.* To prepare the feet, dip them in boiling water for a few seconds, when the scales are easily removed, much in the same way as in the process of peeling the shell off a shrimp. They are then thoroughly washed in cold water, after which they are ready for converting into jelly. The weight of the thirty feet used in this case was 1 lb. 10 oz., and they required boiling gently for two hours in five pints of water, strained and used instead of gelatine.

Chickens' necks.—The value of these for making soup is not, I think, generally known. I have asked cooks to try them, and they have told me that they consider a pound of chickens' necks will go further than a pound of butchers' meat, and help to clear the soup. I have made inquiries, and find that poulterers sell them at 6*d.* per lb.

Chickens' livers.—These, in my opinion, make the finest dinner dish of the class known by cooks as "savouries," especially livers from fattened chickens. The London poulterer does not send the liver when a chicken is ordered. I am told he charges as much as 5*s.* per lb. for livers. In the country they are practically wasted, the usual custom being to cook them with the chicken; they are then dry and tasteless.

Feathers.—These are worth about 4*d.* per lb., though farmers in the neighbourhood of Malton tell me that they receive 6*d.* The hackle feathers from the necks of chickens, if of the right colour, are much sought after for tying artificial flies for the fisherman; for dun cock hackles one firm offered me 4*d.* per dozen feathers. One day when we were killing eighty chickens I casually collected a few of the hackles and sent them to a well-known fishing-tackle shop, and received 2*s.* for them. I calculate that had I collected the suitable hackles from all the eighty it would have taken me about half an hour, and their value would have been about 8*s.* I am told that there are people who go round the London poultry markets collecting feathers, and that they pay for them at the rate of 1*d.* per neck.

Gizzards.—These are very nutritious, and if obtainable in any quantity should be a saleable product.

Offal.—The offal of fattened chickens contains a large amount of fat, and should be of considerable feeding value for pigs. What becomes of this I have no knowledge, but in most cases it is probably thrown away, and in large towns its removal is probably paid for by the poulterer.

Manure.—I am of opinion that the manure of fattened chickens is not appreciated to its full value, that by allowing the liquid to drain off the percentage of moisture it contains might be greatly diminished, and that the use of lime in the fattening shed materially

modifies its value by its effect on the nitrogen contained in the manure. I believe that sawdust, with a small proportion of carbolic acid added, would prove a more powerful disinfectant, and is altogether preferable.

I see no reason why the bye-products of chickens should not be raised to return as much as 6*d.* per bird if due attention be devoted to economy. My estimate is based on the following figures, which represent the theoretical value of the bye-products of a thousand fattened chickens.

	£	s.	d.
Manurial value of 2 tons of oats and milk required to fatten 1,000 chickens	3	0	0
Net value of legs for aspic jelly	2	0	0
Feathers	3	4	0
„ for tying flies	2	0	0
Livers for savouries, 1,000 at 2*d.*	8	5	0
Necks	7	0	0
Offal for feeding pigs	1	0	0
	£26	9	0

A. H. CATHCART.

31 Grosvenor Place, S.W.

FOOD PRESERVATIVES.[1]

ADMITTING that the preservation of food is absolutely necessary, we may yet properly consider whether the methods adopted are such as commend themselves to approval or not, or whether certain of them should not be forbidden, or at least strictly regulated. Besides what may be called the natural preservatives, there is a class of chemical substances called Antiseptics. Their operation varies considerably; in some cases they act simply by combining more or less firmly with water; in others by coagulating albumin, which is one of the nitrogenous ingredients of food most prone, in the presence of moisture, to putrefactive change; in others they act by preventing the development of ferments, or by killing any that exist.

Food preservation is naturally an art of very ancient origin, and is common to every country in the world in some form or other. The principal methods for effecting it are by (1) Drying (heat), (2) Smoking, (3) Salting, (4) Sugar and Vinegar, (5) Exclusion of air, (6) Certain mineral or organic antiseptics, (7) Cold.

The necessity for the preservation of food depends on two facts, (1) that it is in many cases indispensable to store it till wanted,

[1] From the Presidential Address by Alfred Hill, M.D., before Section I. (Sanitary Science and Preventive Medicine) of the Sanitary Institute (Congress at Birmingham, 1898).

especially for use in the Army and Navy for long expeditions, and even during transport from one part of the world to another; and (2) that from its organic and complex nature it is very prone to decomposition. Now we know that in order to bring about this change the simultaneous action of four agents is required: water, air, a certain degree of heat, and the action of certain micro-organisms. If the concurrent action of these be destroyed by the removal of one of them, decomposition is prevented, and it is on the recognition of this truth that several processes of food preservation are based; for instance, by the process of drying or the removal of water, by the exclusion of air, or by the abstraction of heat and so lowering the temperature beyond a certain point. Such is the case with articles of food, whether vegetable or animal, but the larger quantity of nitrogenous matters in the latter, and their more complex chemical composition, cause them to pass the more readily into fermentation or putrefaction. The powerful predisposition to change conferred by water is seen in milk and all succulent substances, while with the cereals, containing little water, ordinary careful storage is sufficient for their preservation. The removal of water alone, therefore, for the preservation of certain kinds of food is very common.

Drying as a method of preservation receives abundant illustration in the vegetables and fruits which so commonly occur in our markets, and are articles of daily consumption; in the stock fish, as dried cod fish is called, and in *pemmican*, *charqui*, and *carne secca*, or dried meat of South America and Africa, as well as of northerly regions. In such cases only, or principally, the heat of the sun is taken advantage of. Familiar examples of dried fruits are seen in figs, raisins, currants, prunes, dates, and many other products of the vegetable world. Sometimes artificial heat produced by the burning of certain kinds of green wood of an aromatic character is used, and in these instances the heat is assisted by the smoke, which contains certain antiseptic principles, such as creosote in small quantity. Smoking is one of the older and more restricted forms of preservation, and, like drying and salting, is proved by experience to be unobjectionable.

Salting is the most generally employed method of preserving many kinds of food, especially meat, fish, and eggs, and, among vegetable substances, gherkins and olives. It is probably also the most ancient, as well as the most universal method. Besides being a very efficient preservative, salt is a very suitable one to employ for various reasons. In the first place it is a natural and indispensable ingredient of the animal body, which contains roughly about $\frac{1}{2}$ lb. of it, to supply which an adult takes with his food $\frac{3}{4}$ oz. a day; it is never absent from the tissues and certain fluids and secretions, and is therefore absolutely essential to life; it is indeed to be regarded as a mineral food, as necessary to the constitution and repair of the body as lime or phosphorus, or the organic elements themselves. The salt-licks which wild cattle will go miles to visit show how powerful is the instinctive desire for salt, and probably

explains why cattle in farmyards will drink the filthy contaminated puddles there in preference to purer water which is equally accessible. Secondly, it is agreeable to the taste, an indispensable quality in food, without which it would be ungrateful and indigestible. It furnishes, after decomposition in the body, hydrochloric acid to the gastric juice, and the chlorine of the chloride of potassium which is found in the red corpuscles of the blood and in muscle, while it provides sodium for the soda salts, so characteristic of bile, and for the phosphate of soda always present in the blood. The action of salt in preserving meat is considered to be due partly to the property which it possesses of removing the water and juices, so that it withdraws one of the four agents which have already been enumerated, and the co-operation of which is essential to decomposition, and partly in contracting the tissues and rendering the albumin less susceptible to change; but independently of these actions it is to a certain extent antiseptic in its properties, though not sufficiently so to be injurious, unless used in unmistakable excess.

It is only necessary to mention the effect of sugar in preserving fruits, condensed milk, and meat, while vinegar has a still more restricted but perfectly unobjectionable application.

Exclusion of air, with its attendant sterilisation and exclusion of bacteria, is a means of food preservation which has been in use for a long time, and it acts by the withdrawal or exclusion of that elementary constituent of the air which is more or less essential to the process of decay, viz. oxygen. There are many ways of effecting the exclusion of air, the majority of them, however, being only imperfect and temporary in their action. For meat, coatings of gelatin or of glycerin or a combination of the two have been employed, of collodion and of paraffin wax. Certain salts having a strong tendency to combine chemically with oxygen, such as the sulphites of lime, magnesia, and soda, have been used either in solution or in powder. The sulphite of lime in the latter form is popularly known as "meat preserver," and may be of much advantage in households in preserving meat for a time in hot weather. Fat in the form of suet and oil is also largely used, either alone, or together with hermetical sealing in vessels. Fats and oils act mechanically in excluding air, and the latter are much used for preserving sardines and other fish.

But of all the plans adopted for excluding air, the sealing up of food in vessels from which the air has been excluded, either simply or by its replacement by some other permanent and inactive gas, such as carbonic acid (carbon dioxide), carbonic oxide (carbon monoxide), nitrogen, or by sulphurous acid, is found to answer best. The simple expulsion of air by heat and the consequent generation of steam in the vessel, and the permanent exclusion of the air by hermetical sealing, receives a very extensive application in the tinning of Australian and American meats, which are so abundantly consumed at the present time, and the process is applied also to the preservation of many kinds of food, both animal and vegetable. Its employment does not appear to render meat either less nutritious or

less digestible, in which respect it has a great advantage over drying, smoking, or salting. It allows of the meat being flavoured, and if it leaves it cooked, or partly so, this appears to be no objection, and very often a great advantage, while it has the recommendation of sterilising the substance preserved.

In my capacity of Public Analyst to Birmingham I have necessarily had considerable experience of the adulteration of important articles of food with preservatives, some of which are of quite modern application, such as boric acid, borax, salicylic acid, and formic aldehyde, but others are sometimes employed, such as sodium fluoride and the sodium carbonates.

During the two years from the middle of the year 1896 to that of 1898, I examined 1,016 samples of *milk*; of these 88 were "preserved," 59 by boric acid, and 29 by formic aldehyde, 17 of the preserved samples were otherwise adulterated, and 17 others were of low quality. Probably a larger number would have been found fortified, but of the 1,016 samples about 400 were not examined for formic aldehyde. Out of 574 samples of *butter* 216 contained boric acid, and 45 of the 216 borated ones were further adulterated with foreign fat. The *margarine* samples, 33 in number, purchased under the Margarine Act, came out worse than the butters, no less than 28 containing boric acid.

Out of 7 samples of *sausage* 4 contained boric acid, and of 6 samples of *cream* 5 contained boric acid, and one of the 5 salicylic acid as well. Four samples of *bacon* out of 6 were preserved with boric acid, 4 of *ham and tongue* were all preserved with it, so were 1 out of 3 *pork pies*, 1 out of 2 *pickled meats*, and 1 out of 2 *polonies*. Five samples out of 6 of *jam* contained salicylic acid.

Of 11 samples of *ipecacuanha wine* 5 contained salicylic acid, 3 were deficient in alcohol. Of 12 samples of *sherry* 1 contained salicylic acid and only 12·4 per cent. of alcohol. The addition to the wines no doubt had for its object compensation for the insufficiency as a preservative of the small quantity of alcohol.

The introduction into food of substances of the character of chemicals and drugs, the action of which is little understood, presents a new difficulty to the analyst, and may constitute a grave danger to public health. The food purveyor is continually seeking to discover new methods for improving the appearance, for preserving the freshness, or for otherwise manipulating the food he deals in. As long as these methods are justified by experience or are known to be harmless, nothing can be said against them, but neither experience nor knowledge can sufficiently assure us on this point with regard to the safety of the preservatives which have of late years come into vogue.

The substance principally used in preserving milk, butter, cream, and meat, is boric acid, or its salt borax, or a mixture of these with each other, and with substances such as common salt. We have to ascertain then what are its effects on health, and though the evidence on this point is not as complete as could be desired, it is sufficient to guide us in forming an opinion.

The British Pharmacopœia includes boric acid and borax amongst its drugs, and gives the dose of the former as ranging from 5 to 15

grains, and of the latter from 5 to 20 grains for an adult. We cannot therefore avoid the conclusion that it is generally regarded as a therapeutic agent capable of exerting a considerable influence on the economy, and boron compounds being foreign to both food and the constitution of the animal body, any comparison between it and salt is altogether untenable. It has been experimentally shown that boric acid is fatal to the lower organisms, both vegetable and animal; it is also fatal to the higher vegetable organisms. Hötter proved that it destroyed the chlorophyll and so arrested assimilation; the roots by which absorption takes place soon die and boric acid was found more hurtful than its salts.

Various physiological experimentalists have paid attention to the effects of boric acid on man and animals. Mattern found that a dose of 30 grains dissolved in about 2 ounces of water (2 grammes in 50 grammes) induced in him violent pain in the stomach and diarrhœa, and that doses of 8 to 30 grains dissolved in the same proportion of water administered to rabbits and dogs made them unwell and produced diarrhœa and emaciation, while in some few cases fatal results followed.

Dr. Dixon Mann, in his "Forensic Medicine and Toxicology," states that when experimentally administered to animals, boric acid has been found to produce prostration, feebleness of pulse, diminution of respiratory activity, parenchymatous nephritis, cloudy swelling with fatty degeneration of the epithelium, and hæmorrhages under the capsule of the kidney. Affection of the skin is one of the most constant signs of boric poisoning.

According to the careful and repeated experiments of Förster and Schlenker, made with a view of ascertaining the effect of boric acid on the utilisation of food in digestion, a daily dose of from half a gramme to three grammes added to human diet affects the absorption of the nutritive substances ingested, and probably occasions an increased separation of intestinal epithelia or an increased secretion of intestinal mucus. Förster thinks that borax and boric mixtures will act like boric acid.

It is only fair to say that some authorities consider the amount of boric acid actually required for preservative uses is without injury. Liebreich is one of these, but he does not support the view by any experiments, and he does not indicate how only the amount required is to be insured. This amount, it is evident, may from a variety of causes be easily exceeded.

Dr. Chittenden of Yale University has published the results of experiments with boric acid and borax on dogs, from which he concludes that a dosage of 2 to 5 grammes of borax per day, given to dogs weighing from 10 to 12 kilograms (22 to 26 lb.), mixed with their food, is apparently without effect upon those nutritional processes which have to do with the utilisation of the proteid food-stuffs. He observed no distinct increase in the amount of fæcal nitrogen, thus indicating that the substance exerts no inhibiting influence on the digestion or assimilation of the proteid or albuminous foods. Nor is the amount of fat eliminated in the fæces influenced to any

considerable extent. But he observes that there was an influence upon the urine, which had a tendency to become alkaline owing to the rapid elimination of the borax through this channel, and a slight diminution in the volume of the urine.

With larger doses of borax, however, positive evidences of physiological disturbance were found. With dogs of 10 kilograms (22 lb) weight, daily quantities of 8 grammes of borax, equal to 1·21 per cent. of the daily food and drink, or nearly 3·5 per cent. of the food alone, have a distinct stimulating effect on proteid metabolism, increasing the output of nitrogenous matter through the urine. Coupled with this effect is a pronounced tendency to diminish the assimilation of both proteid and fatty foods, increasing the weight of the fæces and their content of both nitrogen and fat. Further, with very large doses of borax there is a tendency toward diarrhœa, and an increased excretion of mucus in the intestinal tract. This latter effect was observed by Förster and Schlenker. The presence of 1·5 to 2·0 per cent. of borax in the daily food is very liable to produce nausea and vomiting.

Dr. Chittenden further observed that boric acid acts in much the same way as borax; it is said that in doses up to 3 grammes a day it is apparently without influence upon proteid metabolism or upon the general nutritional processes of the body. It has a less disturbing effect than borax upon the assimilation of proteid and fatty matter in the gastro-intestinal tract, the doses mentioned producing no increase of either nitrogen or fat in the fæces. Like borax, however, increase of the dosage to 1·5 to 2·0 per cent. of the daily food is liable to produce nausea and vomiting. It does not, like borax, appear to affect the volume of the urine, nor does it cause it to become alkaline. Its effect on metabolism seems to be similar to that of common salt, *i.e.* it tends to increase proteid metabolism.

I would remark, in reference to the processes of chemical digestion in the laboratory, and experiments on the lower animals, that the conditions are not the same as in the human subject. The chemical experiments outside the body lack the participation of vital action, while the physiological effects on the lower animals are often widely different from those on man. While, therefore, they must be admitted to possess great value, they are not conclusive.

Whatever minor differences may exist among physiological experimenters and others, they agree upon one thing, viz. that even if small doses exert apparently no serious influence upon health, the same cannot be said of large doses. Here then is one great source of danger, inasmuch as it is impossible to control the quantity of the preservative added by one person alone, while there is no guarantee that successive persons may not each make an addition of it to one and the same article of food. A striking case illustrating this repeated addition of a boric preservative is reported by Dr. M. K. Robinson, Medical Officer of Health for East Kent.

Dr. Robinson had to investigate a sudden serious outbreak of illness. Five out of the seven inmates of the house were attacked within a short period of each other. Suspicion attached to the milk, which had been taken alone, also with tea and in the form of *blanc-mange*. Both to the morning and afternoon supply the cook had added a preservative which was found to contain boracic acid. A sample, as delivered by the dairyman, was analysed, and found to contain a similar substance. Thus for the same purpose a preservative had been added twice, the result being that an overdose had been administered. To nine fowls was given the residual portion of the *blanc-mange*. Five of them which consumed the larger quantity all died, while the remaining four suffered badly, but recovered. I may remark that this case did not undergo any rigid chemical and bacteriological examination. Dr. Robinson urges that the addition of the drug should be regarded as an injurious adulteration. If such results, he says, can be produced in the case of adults it is not unreasonable to presume that infants cannot take with impunity long continued doses in their staple food. The opinion is general among physiologists that all preservatives, when effectual either from their nature or quantity in so injuring the micro-organisms which bring about fermentation or putrefaction in food as to inhibit their action, also injure those persons who consume such food. If a preservative substance can so influence the protoplasmic integrity of bacteria and other low forms of life as well as of the higher forms like ordinary plants, it is difficult to conceive that the same basis of life-tissue in animals, especially that of the mucous membrane of the alimentary canal, should not also be injuriously affected, to say nothing of those beneficial bacteria concerned in the digestive processes. It is true that it is most difficult to trace the connection between cause and effect in these cases, and also very difficult to determine with precision the degree of the unwholesomeness of preserved foods, but as the preservatives are all drugs or toxic substances, it is only reasonable to require that proofs of their non-injuriousness under the circumstances of their use be adduced before their use be sanctioned, and that the *onus probandi* rest upon those who use them.

In support of the opinions of the physiological experimenters and toxicologists already quoted I may add those of one or two other toxicologists of eminence. Dr. Stevenson and Dr. Luff are both gentlemen of large and special experience, and they are analysts to the Home Office.

Dr. Stevenson, in giving evidence for the defence in the Pontypridd butter case in January 1898, said the effect of small doses was still *sub judice*. He did not think that an habitual dose of four grains a day would produce any deleterious effect on the constitution except there be some peculiar idiosyncrasies. He thought that ten grains a day—ten to fifteen grains a day—is the maximum permissible to an adult, and that there was no safer preservative than salt. If asked to advise what quantity of boric acid he would allow milk to contain, he replied that he would not allow any to be used, his reason being that it enables milkmen to palm off stale milk as fresh; he had recently stopped its use in a very large establishment.

Dr. A. P. Luff, in evidence for the prosecution in a case of adulteration of butter by boric acid, expressed the opinion that the equivalent of a little over four grains of boric acid taken daily would prove injurious to health. Whilst constantly taking boracic acid a person would be depressed, and mischief would be set up in the kidneys; he would advise the prohibition of the use of boracic acid in food.

So much then for the opinion of toxicologists. On turning to medical practitioners, physicians and surgeons, we find a pretty general concurrence of opinion on the main question. Some few years ago the Vestry of St. Mary Abbotts, Kensington, was anxious to obtain a definite and authoritative pronouncement on this question of preservatives, which, besides being one of great interest to themselves, as the body responsible for the freedom from adulteration of the food sold in the parish, was a source of much embarrassment to their able analyst, Mr. Cassal, to whose Reports I am indebted for this information. They, therefore, consulted three of the most eminent medical men of the day with respect to the admixture of boracic acid and its compounds with articles of food.

Sir Andrew Clark made the following remarks: "Seeing that chemical compounds are now widely employed in the preparation and preservation of foods, knowing that many of them, although innocuous in small occasional doses, become in small doses continued over long periods destructive to health; and furthermore believing that many obscure and incurable disorders are begotten in this manner, I regard the inquiry proposed by your Vestry as one of the greatest importance to the well-being of the community, and certain, if successfully completed, to prove of great public advantage."

Sir Henry Thompson replied "that there was no doubt, on the authority of physicians in Germany and in this country, that boric acid in what was called 'full doses' was an irritant to the digestive organs, but that it by no means followed that a small quantity should exercise any evil influence whatever. He was of opinion that eight or ten grains to the pint of milk, the amount generally used, would not be injurious to the adult who consumed a pint daily . . . but that on the other hand the infant, who was a large consumer of milk, was also much more liable to injury by the admixture of boric acid, being far more susceptible than the adult to the influence of all chemical agents. The proportion named would be calculated to be injurious when taken habitually, certainly to children under three or four years of age."

Sir Henry goes on to say that he "was disposed to believe that the employment of a small proportion of boric acid might be permitted in the milk trade with advantage to the consumer on the following conditions: 1. A declaration of presence or absence of a preservative; 2. A precise statement to be made on a label affixed to vessels containing milk or cream, bearing the name of the salesman, and naming the preservative employed, and the quantity added per pint; 3. A similar ticket to be supplied to the retail purchaser; 4. When samples are found to contain more than stated, the salesman should be prosecuted for selling milk which is adulterated, knowing it to be so. Such regulations would ensure to each individual, who might desire to exercise his own judgment, the opportunity of doing so."

The third referee, Dr. Lauder Brunton, stated that he had no personal experience in the matter, his information was derived from books, and "upon this authority he stated that it was known to be a poison in large doses, and had also been found to be injurious when added to foods."

"The Lancet Special Sanitary Commission on the Use of Antiseptics in Food" in 1897 consulted certain members of the medical profession on the subject. The four questions put were:—"(1) Is the presence of small quantities of salicylic, boric, benzoic

acids, or 'formalin' in food, in sufficient quantities to preserve it, injurious to health? (2) Should the use of antiseptics for this purpose be forbidden by law altogether, or (3) should legislation be brought to bear on the restriction of the amount, or (4) should the law insist that when preservatives are used the fact should be stated on the label?"

Sir Henry Thompson, besides embodying in his reply the substance of his remarks already quoted, said he entertained "a very strong objection to the dietetic use of any drugs."

Dr. Pavy replied very much in the same strain as Sir Henry Thompson.

Dr. F. J. Allen, Professor of Physiology in Mason College, Birmingham, remarked that "whatever antiseptic may be used, it should be remembered that in order to obtain its due effect there must be enough present to exert a decided influence on protoplasmic activity. This effect can hardly be expected to be beneficial to the tissues of the alimentary canal. Even the disinfection of the contents of the alimentary canal is a doubtful blessing, in most cases because the beneficial organisms are thereby destroyed. However harmless an occasional dose of boric acid (or one of its compounds) may be, it is evident that the case may be different when nearly every article of diet contains it."

Dr. G. Sims Woodhead, after speaking of the difficulty of forming a very definite opinion on the subject, remarked that idiosyncrasy had to be taken into account; salicylic acid, boric acid, and the like may be comparatively harmless in 99 cases out of 100, and yet exceedingly harmful in the hundredth case. We do not know as yet what effect certain of these drugs—formalin, for example, which acts very directly on albuminoid substances—may have upon food stuffs, especially as regards their actual digestibility, and until these points are settled it should certainly be illegal to add them. The last point to be considered is that allowing the use of such preservatives is a direct incentive to the distribution of "doctored" articles of food. Taking milk as an example, it is possible, as we know, by the use of chalk and other substances to render sour milk saleable as fresh milk, and it is imaginable that, by the addition of chalk and, say formalin, such milk may remain saleable for some time after it has been "doctored," but no one would convince anyone who has studied the question of milk as a food for children, or would contend, that such milk is fit for food for any but the most robust digestion. The same theory should be carried into every question connected with food supply.

Sir Benjamin Ward Richardson thought preservatives necessary, also harmless in proper quantities. A licence ought therefore to be given permitting, in every case where it is necessary to preserve, a certain fixed and not dangerous quantity of an antiseptic, and it should be stated on the label what that antiseptic may be and what is the quantity of it used.

Dr. Lauder Brunton's views and recommendations are in line with those of Sir Henry Thompson.

Sir William Roberts concludes that "What is wanted is an inquiry, and it would be a very long and difficult one."

While there is some difference of view expressed in the foregoing replies, they are pretty unanimous in the opinion that the antiseptics above named taken continuously in food in sufficient quantity to preserve it are injurious to health. Some would not oppose the use of antiseptics altogether, but would place restriction

upon the amount used, but they are absolutely unanimous in any case in requiring that the name of the substance added and its amount should be stated on a label attached to the article when delivered to the buyer.

But there are some other points demanding attention besides the four embraced by the "Lancet" inquiry. It is important to consider what would be the effect of a larger quantity of preservative than that which is "necessary" in one staple article of food, and what again if a number of articles of food consumed at nearly every meal contain it. Food purveyors have very indefinite notions on the question of quantity, and while one considers 18 grains of boric acid sufficient to preserve a pound of butter, another uses for the purpose 80 grains; but if 18 grains are all that is necessary, why use 80? For if the former quantity is harmless there is no proof that the same can be said of the latter. Neither is there any assurance that the same article may not be dosed more than once, or that more than one antiseptic may not be originally added, both of which cases I and others have known to occur. If a question bearing on these points had been submitted, no doubt the answers would have constituted a unanimous and unqualified condemnation.

From this point of view I can only come to the conclusion that the use of chemical preservatives ought to be prohibited altogether. This is the law in New York, with regard to milk, passed in 1893, by which it was enacted "that milk is adulterated to which has been added or to which has been introduced any foreign substance whatever." There is a brevity, a simplicity and a directness of purpose in this enactment which is most admirable in these days of clauses so constructed that a clever advocate can prove that they mean anything, including sometimes even what they were intended to mean.

France has a similar enactment, and in Germany all antiseptics are illegal, boric acid in meat especially, it having been found to cause gastric derangement. In Belgium also, as well as in many other countries, as Spain, Italy, Holland, and some South American States, the addition of preservatives to food is absolutely forbidden. But in England, the first country to pass an Adulteration Act, no direct action is taken to prevent the use of preservatives; as such they can only be dealt with as adulterants, injurious or otherwise, under the Sale of Food and Drugs Acts, in the same way as chicory in coffee or alum in bread, or any other ordinary adulteration, so that analysts are placed in the difficult position of having to prove in each case that the substance added is injurious to health, because although strictly it is an adulteration in being foreign in its nature to the article of food, yet so small an amount as half per cent. or even one per cent. cannot be looked upon as materially interfering with its bulk and so constituting a commercial fraud. This fact has proved a great stumbling-block in the way of prosecutions for the addition of preservatives, and it is only quite recently, and principally within the year 1898, that convictions have been obtained at

Barry, Salisbury, Pontypridd, Birmingham, Marlborough, Pontypool, Chester, and Llangollen, for the addition of boric acid to milk and butter, while for the addition of salicylic acid to beer, ipecacuanha wine, lime juice cordial, and quinine wine, convictions have been obtained in Burton, Wolverhampton, Liverpool, and Swindon.

In considering this question of small quantities of preservatives, we can scarcely regard them as fraudulently increasing the bulk, weight, or measure of the article. On the other hand we must not confine our view to the injury which they cause by their own direct physiological action; we must bear in mind that they enable foods to be sold as fresh which are stale, and which have undergone such putrefactive changes as to make them frequently harmful, and sometimes actually poisonous.

One of the difficulties in the way of putting down the use of preservatives is the different way in which it is regarded by the bench in adjudicating on these cases. It seems to me that magisterial decisions very frequently hinge on an altogether erroneous application of one of the provisions of the Adulteration Act, and so lead to the dismissal of cases which, if decided on the proper reading of the Act, would result in convictions. I refer to the way in which one clause is made to do duty for another having a totally different application, *e.g.* to the action taken especially on Clause 6, while the decision is ultimately given on Clause 3. Clause 3 provides that "No person shall mix, colour, stain, or powder, or order or permit any other person to mix, colour, stain, or powder any article of food with any ingredient or material, so as to render the article injurious to health . . ." &c. Clause 6 provides that "No person shall sell to the prejudice of the purchaser any article of food or any drug, which is not of the nature, substance, and quality of the article demanded by such purchaser. . . ." &c.

Prosecuting authorities believing in the injuriousness of preservatives, but knowing the difficulty of proving injury under Clause 3 of the Adulteration Act, elect in such cases to proceed under Clause 6, which does not require proof of such injury, but only proof that the article contains something "which is not of the nature, substance, and quality of the article demanded." The evidence for the prosecution is not disputed by the defendant, for he knows he cannot successfully dispute it, so he adroitly puts forward the plea that the added substance is not injurious to health, and thus diverts the attention of the bench from the provisions of Section 6 to those of Section 3. To my legally untutored mind, it appears that such a plea should be instantly disallowed, because it entirely evades the point upon which proceedings are taken, and introduces another which is not in question. Too often, however, the bench is led astray by the drawing of this advocate's red herring across the forensic trail; the bench straightway requires proof that the substance is injurious to health, a thing which is exceedingly difficult to furnish, and which the prosecution does not contemplate, and which it has not brought up for consideration; evidence is then adduced by the defence to prove that the substance added is not

present in sufficient quantity to be injurious, with the result, often, that a benevolent and sympathetic bench, in the face of conflicting testimony of so-called experts, decides to dismiss the case, and that on a point to which the Clause (6) has no reference, and under the provisions of which the prosecution has not taken action.

Salicylic acid is by no means so extensively employed for preserving food as boric acid, largely for the reason that it is less soluble and less pleasant to the taste, though it has been largely used on the Continent for preserving milk, and it has been used also to preserve meat and fish ; I have found it in cream, in jams, and in spirituous compounds. Commercial salicylic acid is said to sometimes contain carbolic acid ; it possesses irritating properties ; its vapour attacks the eyes, and it excites coughing. According to F. D. Simons it retarded peptic digestion, and Chittenden observed that salicylate of soda and borax act antagonistically to the digestive ferment. Though not very poisonous in moderate doses and in dilute solution, yet in large doses it is said to produce serious cerebral symptoms, and it is well known to medical practitioners to produce in medicinal doses headache, deafness, singing in the ears, and loss of appetite. French authors especially call attention to the injurious action in diseases of the kidneys and to its slow elimination in aged persons.

Benzoic acid is another drug that may be classed with salicylic acid. It came into use in France after the suppression of the use of salicylic acid, partly because, according to Hehner, it possesses greater preservative power, and partly because it is more difficult to trace. It has a sharp taste, and produces a peculiar irritation in the throat. Professor Salkowski says that benzoic acid possesses stronger antiseptic properties than salicylic acid, and that both are equally unsuited for internal administration, as they enter into combination with the soda of the blood.

Sulphurous acid, free and in combination with calcium and sodium, is much used for the treatment of wine and beer, as well as for lime-juice and meat. It acts as a destroyer of those micro-organisms which produce the diseases of wine, checks the fermentation, and improves the keeping powers of beer. The question of quantity comes in here as with other preservatives, and while it is considered that small quantities of the acid and its salts are apparently harmless, larger quantities are injurious to health, as shown by Pfeiffer. He found that 80 milligrams (equal to $1\frac{1}{4}$ grain) of sulphurous acid dissolved in sugar and water and distributed over 24 hours was badly tolerated by women, producing diarrhœa, vomiting, and discomfort, lasting over some days. The magnesium and sodium salts were much better tolerated, but Pfeiffer himself and some friends suffered from pressure and pain in the stomach after taking half a gramme of sodium sulphite largely diluted with water.

Fluoride of Sodium is a mineral salt which has been more recently vaunted as not only very efficient but as "absolutely harmless" for the preservation of milk and butter. It is very remark-

able that every preservative brought forward is said to be harmless. Sodium fluoride according to Arthus completely restrained the butyric ferment (microbe) in a solution containing 0·4 per cent. of the fluoride, and 0·3 per cent. will restrain the formation of both lactic and butyric acid, whilst milk treated with this proportion will keep indefinitely. Experiments made by the Pennsylvania Department of Agriculture showed that while it did not interfere with the action of diastase and some other ferments on starch it completely prevented the action of the pancreatic ferment. Rabuteau stated that 0·25 gramme (less than 4 grains) affected him with salivation, dogs vomit after taking 0·5 gramme, and larger doses produce cramps, paralysis, and death. This is perhaps, the reason why we have heard very little about this new preservative agent. It seems to have received its principal application in France as a preservative of wines, for which purpose very small quantities seem to suffice.

Formalin, which is a 40 per cent. solution of formic aldehyde in alcohol, has been recently introduced as a food preservative, and I find it frequently added to milk : Normandy milk is strongly dosed with it according to Mr. Stokes, and on the same authority it is said to have been tried by London dairymen, but to have been abandoned owing to its disadvantages. What are its properties? F. D. Simons says that in his experiments it retarded pancreatic digestion, and Weigle and Merkel say that it renders the albuminoids of milk less digestible ; an addition of one part of formalin to 500 of milk renders the casein insoluble in pepsin and hydrochloric acid. According to Rideal 1 ounce of formaldehyde (equal to $2\frac{1}{2}$ oz. 40 per cent. formalin) does the work of 5 pounds of borax and boracic acid, so that if a very small addition is sufficient its greater potency makes up for its smaller quantity. Attempts to preserve fish by means of formalin failed on account of its hardening effect. This was apparently due to the coagulation of the albuminoids, the samples being made so hard as to be rendered unsaleable, even by solutions containing 1 part of formalin in 2,000.

Carbonate of Soda and *Bicarbonate of Soda* have both been added to milk to preserve it sweet, or to neutralise it when sour ; the acid would be unpleasant to the taste, and would at a certain point cause it to curdle. The acidity results from the decomposition of the milk sugar and its conversion into lactic acid. The soda added combines with the acid, neutralising it, and so preventing its souring or curdling effect. The habitual use, however, of a soda salt is to be strongly condemned, whether it be swallowed as carbonate, or lactate, or a mixture of the two. One of the pleas of persons using preservatives is that they are not seen to produce bad effects, that they are commonly taken as remedies, and are as harmless as useful. But this is begging the whole question, and disposing off-hand of the problem awaiting solution.

If bad effects are not traceable at once, and to single doses or small quantities, no proof is thus afforded that the continued use is harmless. If the substances are used as remedies it must be evident

that the conditions under which they are given are totally different. As remedies they are given for a special curative purpose to persons out of health accepting them voluntarily, and they are only used for a limited time; their dose is carefully regulated; they are given under professional advice and supervision. If mixed with food the conditions are altogether different—there is no curative object, for the consumers are not necessarily ill, they take the substance without requiring it, and involuntarily, without even knowing it, and for an indefinite time. There is no regulation of the dose, which is found to vary very widely, and the substance is administered by lay persons having no knowledge of its nature or the bodily condition of those made to swallow it.

For the reason that milk is the one perfect food, especially valuable for invalids and children, it is the one which *par excellence* ought not to be tampered with. It is true that milk soon changes, it does not keep indefinitely, and evidently Nature did not intend it to do so. The young of all mammals naturally receive it directly from the mother, and the more directly we obtain it the better. It is only the ingenuity of Man which is exercised to circumvent natural law in this connection, and as long as this is done without medication and adulteration there is no objection, and happily we know a safe means of doing it. It is admitted that the decomposition of milk does not occur in properly conducted dairies under forty-eight hours, which should be long enough to allow of its distribution, and where it is found necessary to add antiseptics to make it keep so long, it is because the treatment of it is careless or dirty, or otherwise bad, so that preservatives are often added to the milk of our dairies to compensate for the faults of its treatment which our supineness only encourages. An argument of considerable force against the prevention of change in milk by added chemicals is furnished by the circumstance that morbid milk, whether by itself or mixed with normal milk, very soon changes, and such premature change is of the greatest value as an indication of the unhealthy condition of the milk, and a signal to direct attention to its cause. If the addition of chemicals to food were necessary, some favourable consideration might be given to it, but it is not necessary, as is proved by the fact that it is only used to a limited extent.

Butter is brought here from Australia, a distance of about 15,000 miles, in excellent condition without the addition of any preservative whatever, simply protected by a low temperature. Is it not an insult to common sense to suppose then that it is necessary to heavily drug butter from Cork, or from the continent of Europe, about 200 miles off, and occupying only a few hours in transit? This simple question is answered emphatically in the affirmative by the fact that not all the butter from these places is so drugged, but only some of it.

Out of the 514 samples of butter which I have examined in the last two years, only 216 contained a preservative—boric acid; if the remaining 298 samples could be made, transported, stored, and sold without a preservative, why not the other 216 samples?

That there is just as little necessity for preserving meat by the addition of chemicals is proved by one gigantic fact, viz. that in 1897 no less than 6,551,280 cwt. of meat were imported into this country from Australasia, the Argentine Republic, and the United States, without the employment of any other means than either refrigeration or freezing, the latter method being employed for the meat sent from the two former countries, and "chilling" or refrigeration only for that from the latter.

This brings us then to the last of the modern methods of food preservation on the large as well as on the small scale, and as it is the last so it is the best. The fishmonger avails himself of it in his ice well and on his stall. It is by its agency that all the perishable food on our great liners is preserved during even prolonged voyages, and it is used in the great food depôts in many of our large towns. In Birmingham tons of perishable food are continually preserved by its action, and where such stores do not exist they ought to be provided.[1] In this way all perishable articles can be kept until such times as they shall be required for sale and distribution.

Formerly the methods of producing cold were complicated and dear, and had many drawbacks, but these have been overcome by means of the alternate compression and expansion of atmospheric air, and thus the production of cold is effected in a manner which is not only easy and efficient, but which is remarkably economical. Cold acts not by killing the organisms that effect decomposition, but only by inhibiting their action, in which respect it differs from heat and certain chemical antiseptics, such as chlorine, for instance.

Among the advantages of preservation by refrigeration may be mentioned—

1. It has been proved the most effective as a preservative, surpassing in efficiency salting, boric compounds, or any other practicable method.
2. It adds nothing and subtracts nothing from the article preserved, not even the water, and in no material sense alters its quality.
3. It causes no change of appearance or taste, but leaves the meat or other substance substantially in its original condition, while it renders it neither less nutritious nor less digestible, which cannot be said of some other methods in common use.

My contention is that all additions to food whose influence on health is doubtful ought to be prohibited, and their use supplanted by refrigeration.

A question of such importance calls for something more than mere consideration; from the sanitary point of view it demands action, a vigorous and sustained effort to obtain reform. Something has already been done in this direction, but it has not been successful. I have already referred to the action of the Vestry of St. Mary Abbotts in May 1893; the Vestry also put a question on the subject of boric acid in food to the Local Government Board. The

[1] See *Cold Storage: its Principles, Practice, and Possibilities.* By Dan. Pidgeon, Assoc. Inst. C.E. Journal R.A.S.E., 3rd series, Vol. VII., 1896, pp. 601–617.—Ed.

reply indicated "that the question was one which the Board have no authority to decide," and they referred "the Vestry to note (*d*) appended to the form of certificate in the schedule to the Sale of Food and Drugs Act, 1875, which also authorises the analyst to insert at his discretion his opinion whether any mixture was for the purpose of preserving the article, and whether it was excessive;" . . . also, "to the remarks on the subject at page 6 of the following extract from the Board's Report for 1890–91." The following are the remarks referred to :—

It may be noted that the use of boric and boracic acids as preservatives of butter and other substances liable to decompose speedily seems to be finding increased favour among dealers, and is at the same time creating a difficulty for analysts, since it is not always clear in what cases the addition may come within the proviso of Section 6 of the Sale of Food and Drugs Act, 1875, with regard to "any matter or ingredient not injurious to health" which "has been added to the food or drug because the same is required for the production or preparation thereof as an article of commerce in a fit state for carriage or consumption." There is no doubt that boric or boracic acid, if taken in large quantities, would be injurious to health; but we have no sufficient information to show whether such minute amounts as are generally added as preservatives could be regarded as having that effect, and more exact information is wanted before it can be decided whether a process which *primâ facie* may be regarded as intended to prevent the loss of valuable food must be held to be prohibited by law.

INDEX NUMBERS OF THE PRICES OF COMMODITIES IN 1898.

THE subjoined letter, written by Mr. A. Sauerbeck, was published in *The Times* of January 14, 1899. The term "index number" was defined in the Journal[1] in 1893. The Journal for 1898 (3rd series, vol. ix., Part I. p. 187) contained the index numbers for 1897.

"The following are the annual index numbers of the prices of forty-five commodities, the average of the eleven years 1867–77 being 100 :—

AVERAGE.

1878–87 . . .	79	1889	72	1894	63
1888–97 . . .	67	1890	72	1895	62
	—	1891	72	1896	61
1880	88	1892	68	1897	62
1888	70	1893	68	1898	64

"The index number for last year shows a further improvement of two points; it is still three points below the average of the pre-

[1] See *Prices of Commodities during the last Seven Years* (1886–92). By Augustus Sauerbeck. Journal R.A.S.E., 3rd series, vol. iv., 1893, pp. 394–404.

ceding ten years, but it must be welcomed as the best since the eventful year 1893, the time of the Australian and American crises and the closing of the Indian Mint. The rise is equally shared by the two large classes—food and materials—but in the first case it is entirely due to corn and in the second to minerals. Animal food products were in the aggregate lower, sugar was a little better, but Brazil coffee again considerably reduced. Textiles remained, on the average, on a par with the preceding year, which was the lowest on record. Sundry materials were a little higher, particularly hides, tallow, and oils, while indigo was cheaper.

"Only three articles out of the forty-five contained in my tables showed records of lowest prices—viz. English wool, flax, and indigo.

"The monthly fluctuations were thus :—

1889.	December	73·7	1896.	July . .	59·2	1898.	May . . .	66·4
1890.	,,	71·1	1896.	December	62·0	1898.	June . .	64·7
1891.	,,	71·4	1897.	September	63·4	1898.	July . .	64·3
1892.	,,	67·7	1897.	December .	62·4	1898.	August .	64·0
1893.	,,	67·0	1898.	January .	62·8	1898.	September	63·9
1894.	,,	60·1	1898.	February .	63·4	1898.	October .	63·6
1895.	February	60·0	1898.	March . .	63·0	1898.	November	63·9
1895.	December	61·2	1898.	April . .	65·5	1898.	December	63·8

"The index number at the end of the year was 2 per cent. higher than in December, 1897.

"Taking articles of food and materials separately, the index numbers compare thus :—

—	Feb. 1895	July 1896	Dec. 1897	May 1898	Nov. 1898	Dec. 1898
Food .	63·8	60·0	66·5	71·5	66·2	65·6
Materials	57·0	58·6	59·4	62·7	62·3	62·4

"Articles of food are now 1½ per cent lower, materials 5 per cent. higher than a year ago, but both classes are nearly 10 per cent. above their lowest points on record in July, 1896, and February, 1895, respectively.

"The position of the six separate groups of articles at the end of the last two years is illustrated by the following index numbers :—

—	Dec. 1897.	Dec. 1898	
Vegetable food (corn &c.). .	65·0	62·4	fall 4 per cent.
Animal food (meat and butter)	77·1	76·9	,, ¼ ,,
Sugar, coffee, and tea . . .	51·0	52·5	rise 3 ,,
Minerals	66·6	75·7	,, 14 ,,
Textiles	48·4	49·9	,, 3 ,,
Sundry materials.	62·8	63·1	,, ½ ,,

"The supply of some articles and the demand for others were most powerful elements in regulating the course of prices during the

past year. The supply of corn caused violent fluctuations. Owing to the failure of the Continental harvest, the production of wheat in 1897 was the smallest for a number of years past, and prices advanced considerably in the second half of that year. The scarcity became more manifest in April and May, 1898, and partly owing to American speculation, to the outbreak of the war, and to the suspension for a limited time of the high French duties, prices were carried to an exceedingly high level, considering the general range of values. A collapse followed in June, and in view of the splendid 1898 harvest, the largest on record, prices gradually returned to a more moderate basis. Other articles that were largely affected by the supplies were coffee, with unprecedented Brazil crops and large accumulations of stocks; cotton, with two gigantic crops; and wool, owing to the steady increase during the last few years in the production of the coarser grades, simultaneously with a large decrease in fine wool. Coffee and cotton remained in consequence on a very low level, coarse wool was cheaper than ever, while fine wool ruled about 30 per cent. above the lowest point in 1895. Manila hemp doubled its price during the war, and is still considerably higher than a year ago.

"The articles affected principally by demand were metals. The production of iron in Great Britain and Germany, and particularly in the United States, where the output probably reached $11\frac{1}{2}$ million tons, was larger than ever, but so was the demand, and prices at the end of the year were—for Scotch pig, 49*s.* 6*d.* against 45*s.* 5*d.*; for hematite, 57*s.* 2*d.* against 48*s.* 4*d.*; and for common bars $6\frac{1}{8}$*l.* against $5\frac{1}{4}$*l.* at the end of 1897. The production of copper has also experienced a steady increase, while the stocks have constantly diminished. The average annual prices from 1894 to 1898 were 40*l.*, 43*l.*, 47*l.*, 49*l.*, and 52*l.*; the price at the beginning of last year was $48\frac{1}{4}$*l.*, and at the close $57\frac{1}{2}$*l.* Tin arrived in smaller quantities, and the price rose in the year from 63*l.* to 86*l.*, with a further advance since the beginning of 1899.

"The average price of silver was $26\frac{15}{16}$*d.* per oz., the lowest on record, against $27\frac{9}{16}$*d.* in 189*d.* It stood at $26\frac{5}{8}$*d.* at the end of 1897, and declined to 25*d.* early in March. In May Spain commenced buying, and it is estimated that altogether about 4,000,000*l.* were taken for that quarter. The price ruled between 27*d.* and $28\frac{1}{4}$*d.* during the remainder of the year, and closed at $27\frac{5}{16}$*d.* per oz. The index numbers were as follows (60·84*d.* per oz. being the parity of $15\frac{1}{2}$ to 1 gold=100),—

Average 1897	45·3	End of 1897	43·8
„ 1898	44·3	„ 1898	44·9

"The shipments to India were smaller than in the preceding year, but Russia took a moderate amount, and will still have to purchase silver to some extent for several years to come.

"The production of gold has again expanded, and may have exceeded 55,000,000*l.*, of which, however, the United States alone have acquired between 36,000,000*l.* and 40,000,000*l.*, while

the three most important European banks (of England, France, and Germany) hold 10,000,000*l.* less than a year ago.

"The past year was rich in political events, but it does not appear that they had a lasting influence on trade generally, though, as already mentioned, the American war affected corn and hemp. Business on the whole was more prosperous, the working classes were better employed, agriculture was more profitable, and the metal industries—engineering, shipbuilding, and electrical works, were fully occupied; but there were other branches, particularly the textile industries, which were far from satisfactory. The cotton industry—in this country at all events—was better than in the bad year, 1897, but the woollen industry all over Europe and North America was depressed. Company promotion and new issues of capital have continued on a large scale. They amounted to 150,000,000*l.* in this country, and reached in Germany the record figure of 135,000,000*l.* No doubt things went too fast in the latter country, and hence the squeeze in the money market during the last three months. The surprise of the world was the marvellous development in the United States. The excess of exports over imports (merchandise and silver) had already reached the extraordinary amounts of $358,000,000 in 1896, and $383,000,000 in 1897, but for the past year it will probably be swelled to the huge figure of $600,000,000. It is only natural that under these circumstances everybody should expect a return of American demand for European produce, and when it comes it must have a favourable influence on trade."

THE WINTER OF 1898-99.

For the last three years our winters have been far from what it is customary to term "old-fashioned." In 1896–97 there was no great excess of warmth, but in the following winter the weather was remarkably open, and, singularly enough (for the two qualities are seldom found together), unusually dry. As regards warmth, the winter just ended has proved even more remarkable, and had it not been for a few rare and brief intervals of cold one might have been pardoned for thinking that the season was befooling us, and that in spite of the calendar we were experiencing the weather of an ordinary autumn. In two respects the past winter, in addition to being warmer than that of the previous year, was essentially different. The rainfall was, in the first place, far heavier, especially in the south-western districts, while the weather was altogether more stormy, the two characteristics being due to the same general cause, viz. the frequent arrival on our coasts of cyclonic disturbances from the Atlantic. With regard to the state of the weather over the ocean itself, ample evidence has been borne by the unanimous testimony of all who have had to experience its fury, and also by the sore straits in which many of our finest steamships have

at times found themselves. Some of the worst of the Atlantic storms doubtless spent their violence before reaching these islands, the gales we experienced on shore being certainly more numerous than severe. In two instances, however, occurring respectively at the beginning of January and on the 12th of the same month, the country was visited by westerly gales of more than ordinary violence, the storms resulting in each case in a considerable amount of damage to property and, in some instances, to life itself. In a winter so mild as the last, snow was naturally rare, many places in the southern districts, including the metropolis, escaping with nothing of the kind worthy of mention. The farmer would have welcomed a little more frost, especially in the latter part of the season, when vegetation was generally in a too forward condition. It is satisfactory to know that his hopes in this direction were partially gratified by the week or so of cold weather which set in at the end of February, but in many cases the crops remained in a state ill fitted to stand the frosts and biting winds so often experienced in the early part of an English spring.

The leading features in the weather of last winter are shown in a statistical form on p. 191, the following remarks giving further details of interest in the history of each particular element.

Temperature.—Excepting at the close of January and the beginning and end of February, the mean temperature was almost continuously above the average, the excess being very large in the second and third weeks of each of the three winter months. Taking the season as a whole the mean readings were therefore extremely high, this being especially the case over our eastern, midland, and southern counties, where the excess of warmth ranged from 4° to about $4\frac{3}{4}$°. In the southern district the undue heat appears to have been distributed with fair impartiality throughout the 24 hours, but in other parts of the country the excess was greater in the daytime than at night, the difference in this respect being especially marked in the north-eastern counties. A comparison with previous records shows that while in some parts of our northern counties the winter was little if any warmer than that of 1883–84, over the country as a whole it was the mildest experienced since that of 1876–77. A series of observations made at Greenwich since the year 1841 shows in fact that in this extended period there were only two winters milder than the last, one being that of 1876–77, and the other that of 1868–69. The highest temperatures of last winter occurred very generally on February 10, when the thermometer in the shade rose to 60° and upwards in many parts of the country, to 65° at Cambridge and Llandudno, and to 66° in London. In many districts the readings at this time were no higher than, and in some few places not quite so high as, those registered at the close of February 1891. In the metropolis, however, the maximum of 66° was the highest winter temperature observed since authentic records commenced in 1841. The lowest temperatures of the winter occurred mostly at the end of January or the beginning of February, when the sheltered thermometer registered 10° or more of frost in most

Temperature, Rainfall, *and* **Bright Sunshine** *experienced over* **England** *and* **Wales** *during the Thirteen Weeks ended February* 25, 1899.

(The Winter Season.)

Districts	Temperature: Highest observed	Temperature: Lowest observed	Day temperatures: Mean	Day temperatures: Difference from average	Night temperatures: Mean	Night temperatures: Difference from average	Day and night temperatures combined: Mean	Day and night temperatures combined: Difference from average
	°	°	°	°	°	°	°	°
North-eastern counties . .	61	19	46·6	+4·1	36·0	+2·4	41·3	+3·2
Eastern counties . . .	65	20	47·7	+4·9	36·6	+4·2	42·2	+4·6
Midland " . . .	62	18	47·5	+4·3	36·1	+3·7	41·8	+4·0
Southern " . . .	66	22	48·9	+4·6	39·2	+4·7	44·1	+4·7
North-western counties, including North Wales .	65	22	47·7	+3·7	38·3	+3·1	43·0	+3·4
South-western counties, including South Wales .	63	18	49·5	+3·7	40·0	+3·3	44·8	+3·5
Channel Islands . . .	61	31	52·1	+4·2	43·9	+3·1	48·0	+ ·6

Districts	Rainfall: Days with rain: Number	Rainfall: Days with rain: Difference from average	Rainfall: Total fall: Amount	Rainfall: Total fall: Proportion of average amount	Bright Sunshine: Duration: Hours recorded	Bright Sunshine: Duration: Difference from average	Bright Sunshine: Percentage of possible amount: Percentage	Bright Sunshine: Percentage of possible amount: Difference from average percentage
			in.	per cent.				
North-eastern counties .	52	+ 4	5·8	93	143	+ 7	19	0
Eastern counties . .	51	+ 2	6·0	98	237	+69	31	+9
Midland "	52	+ 5	8·3	117	171	+33	23	+5
Southern "	52	+ 5	8·5	108	207	+40	27	+5
North-western counties, including North Wales	63	+11	10·7	118	151	+23	20	+3
South-western counties, including South Wales	60	+ 8	16·9	145	180	+ 3	23	0
Channel Islands . . .	62	+ 2	12·8	125	184	0	23	0

NOTE.—The above Table is compiled from information given in the Weekly Weather Report of the Meteorological Office. The averages employed are: For Temperature, the records made during the twenty-five years, 1871–95; for Rainy Days, the values for the fifteen years, 1881–95; for Total Rainfall, those for the thirty years, 1866–95; and for Bright Sunshine, those for the fifteen years, 1881–95.

districts, and as many as 14° in some parts of the midland and south-western counties. Sharp frosts were also experienced at the very end of December or in the first week of January, and at the close of February, the thermometer on the latter occasion falling almost as low, and in some places quite as low, as it did a month earlier. Over the country generally the lowest winter temperatures were not widely different from those recorded during the season of 1897–98. They were, however, in many districts not so low as in the two preceding winters, and of course nothing like so low as those recorded during the long and severe frost which prevailed early in 1895.

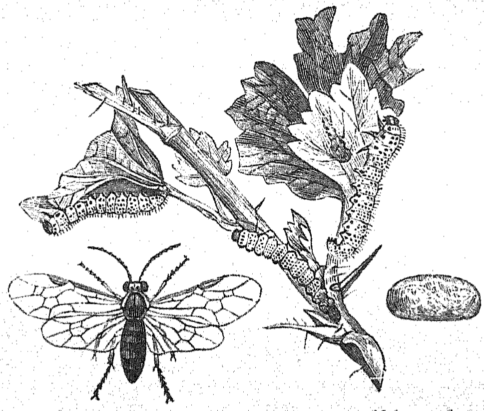
Rainfall was deficient in the second and third weeks in December, the last week in January, and the first and last weeks in February. At other times it exceeded the average, the excess being very large at the close of December, in the second and third weeks in January, and in the second week in February. Taking the winter as a whole, there was a slight deficiency of rain in the eastern, and a somewhat greater deficiency in the north-eastern counties. In all other districts there was an excess, slight in the southern district, but large in the Channel Islands, and very large over the south-western counties, the total amount in the last-mentioned district being no less than 45 per cent. in excess of the average. In all but the north-western parts of the country the rainfall was considerably greater than in the previous winter, but in many districts it was less heavy than in the winter of 1896–97. In the south-western district and the Channel Islands it was greater than in any of the previous five winters. In a season so wet as the last, individual falls of considerable weight were naturally somewhat frequent, the most important cases occurring: (1) on December 6 and 7, over all the southern parts of England; (2) on December 25 and 26, in the western districts; (3) on January 1, in Cornwall and the Channel Islands; (4) on January 20, over Wales and all the more western parts of England; and (5) on February 9, again in the districts last mentioned. Towards the close of January heavy floods were reported in Wales, and the water at Hereford rose to a higher level than at any time since the year 1852. Snow occurred in many parts of our northern, eastern, and midland counties on December 19 and 20, and again on December 30 and 31. On January 1 the northern counties were alone affected, but on the following day there were showers of snow or sleet in many parts of the country, a similar experience occurring on January 11. Between January 16 and 18, and again on January 23, a fall was reported at several of the northern stations, while in the first week of February repeated snow showers occurred in nearly all districts, the amount being very slight in the south, but rather heavy at some places in the north. Throughout January and the early part of February, thunder and lightning were unusually frequent for the time of year, such phenomena being confined as a rule in the winter-time to our western and northern coasts.

Bright Sunshine.—This varied greatly in amount from time to

time, but was more often than not in excess of the average. In the last weeks both of January and February the duration was extremely large, especially in the eastern and southern districts, the amount registered in the earlier instance being the largest observed in any week in January since the recording instruments were started in 1881. Taking the winter as a whole, the figures in the table show that in the Channel Islands the total duration was exactly equal to the average. In all other districts there was an excess, slight enough in the north-eastern and south-western counties, but large in other districts, and especially so in the east, where the winter was sunnier than any of its five predecessors. At Cambridge the total duration was 234 hours, being 72 more than the average, and appreciably greater than in any winter since regular sunshine observations commenced there in 1880. In the midland and southern counties the winter was not quite so sunny as that of 1894–95, while in many other parts of England it was less sunny than that of a year ago, the difference in this respect being very marked in the Channel Islands.

INSECT PESTS OF FRUIT-TREES.[1]

Few object lessons are more convincing than those which may be derived from observation of the ravages of insect and other pests in

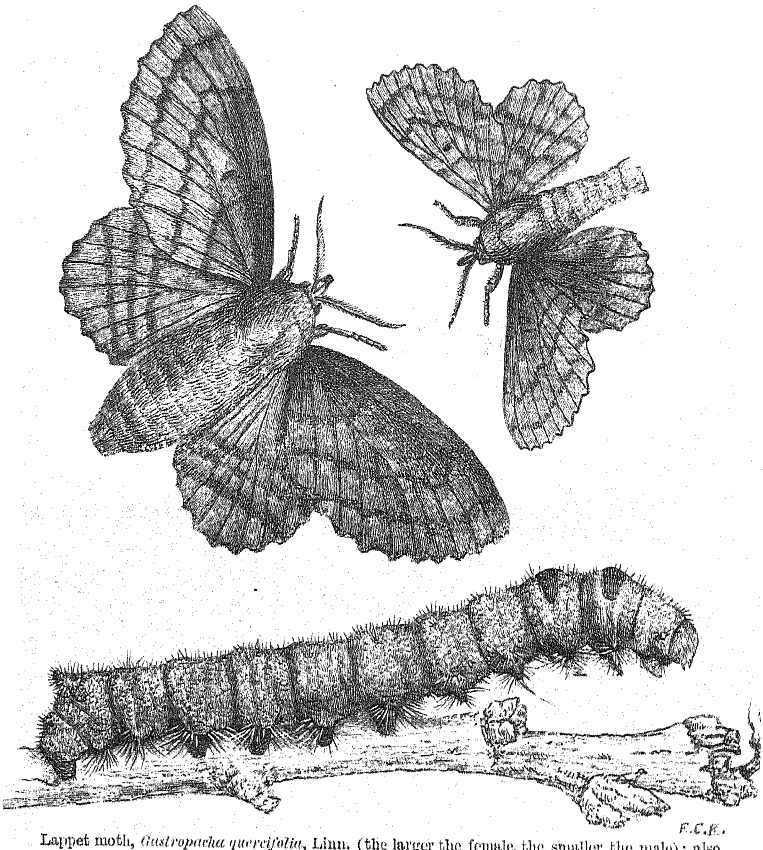


Gooseberry and currant saw-fly, *Nematus ribesii*, Cameron. Male saw-fly, caterpillars, and cocoon; all magnified.

an orchard or a fruit garden, or, indeed, in any garden where fruit-trees and fruit-bushes are included amongst the plants cultivated.

[1] *Handbook of Insects injurious to Orchard and Bush Fruits, with Methods of Prevention and Remedy.* By Eleanor A. Ormerod. Pp. x. + 286, with numerous illustrations. London: Simpkin, Marshall & Co. 1898. 3*s.* 6*d.*

The white fluffy material sometimes seen clinging to the bark of the apple-tree, the small brownish shell-like scales dotted in countless numbers over the same stem, the repulsive little slug-like creatures that sear the leaves of the cherry and the pear, the voracious larvæ that strip a gooseberry-bush of its foliage in a very short time, the early-fallen apple with the tell-tale spot whence a caterpillar forsook the fruit it had served to destroy, the web-nests in which the large

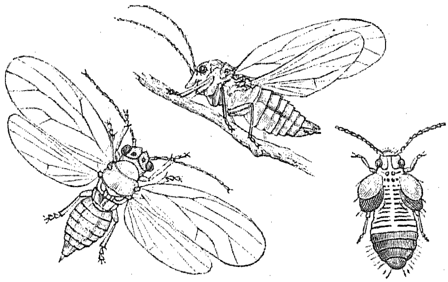


Lappet moth, *Gastropacha quercifolia*, Linn. (the larger the female, the smaller the male); also caterpillar, and apple-twig with leaves eaten away. All from life.

handsome larvæ of the lackey moth live by scores or hundreds, the greatly swollen buds in early spring on the black currant bush—these and other manifestations of insect energy can hardly escape the notice even of people who are not usually observant. They are all associated with injury to the fruit-trees and with consequent loss. Every grower of fruit who takes an interest in his work would be glad to impose a check—if he knew how—upon the

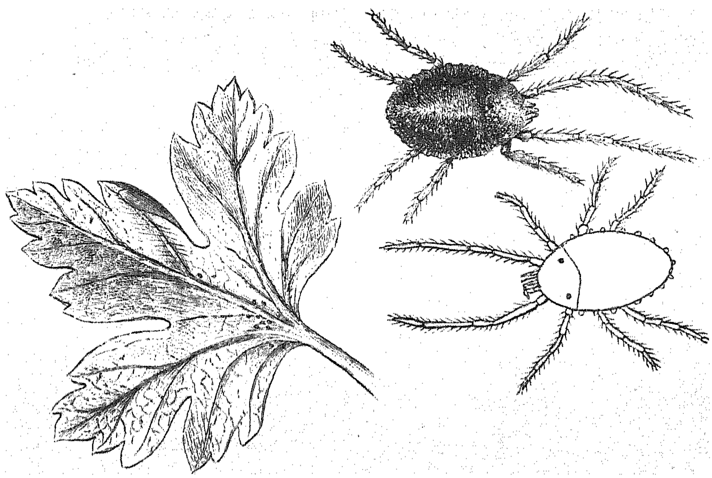
ravages of pests for the maintenance of which he often has to pay dearly enough.

When mischief is ascertained to be in progress, or at least imminent, a natural question at the outset is as to the identity of the perpe-



Apple-suckers, or Apple Chermes, *Psylla mali*, Schmidberger, from life; natural length, $\frac{1}{12}$-inch. On the right, pupa of pear-sucker, also magnified.

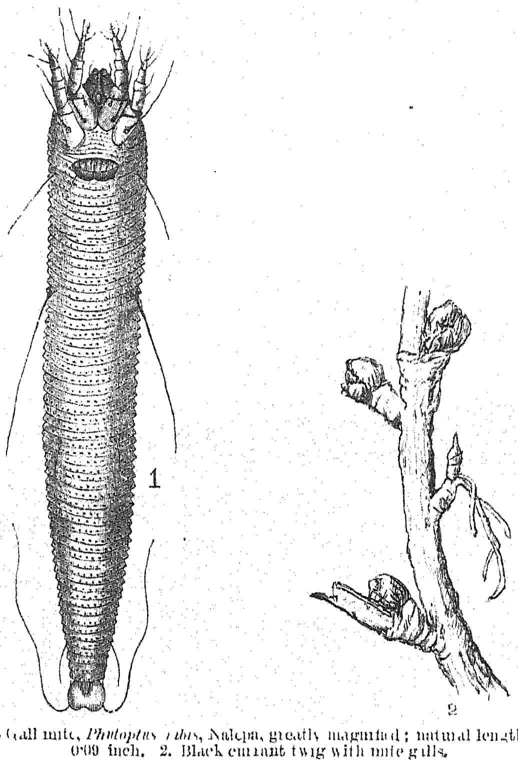
trator. Is it the greedy and quickly-growing larva of a moth or saw-fly, devouring plant-tissue at an alarming rate; is it a member of the prolific aphis family, multiplying with a rapidity of which mere numbers can convey but a poor conception, and undermining the vitality of the plants by sucking their juices; is it one of those



Gooseberry and Ivy Red spider, *Bryobia pratiosa*, C. L. Koch (outline figure after Koch); both magnified. Leaf infested by Red Spider, natural size.

hard little snouted beetles, called weevils, which usually do their fatal work hidden from view; or is it, perchance, a member of the destructive group of the scales? To such questions as these, and more especially to the obvious and practical inquiry, What is to be done? the volume under notice will often afford a ready answer.

In this useful treatise Miss Ormerod has simplified the subject for the fruit-grower by taking the main fruit-crops in alphabetical order, and detailing the insect and allied pests to the attacks of which they are respectively most liable. In this way, the apple, cherry, currant, gooseberry, nut, pear, plum, quince, raspberry, and strawberry are dealt with in the order indicated. All the common pests of each of these fruit-crops are considered at some length, their general structure and life-history being described, together with the nature of the mischief they perpetrate. In every case practicable



1. Currant Gall mite, *Phytoptus ribis*, Nalepa, greatly magnified; natural length of female, 0·09 inch. 2. Black currant twig with mite galls.

measures are set forth for suppressing or checking attacks already in progress, as well as for the prevention of possible future ravages. Under the head of apple the pests which are thus noticed comprise the woolly aphis, apple aphis, codlin moth, figure-of-eight moth, goat moth, lackey moth, lappet moth, small ermine moth, garden chafer, apple sawfly, mussel scale, apple sucker, and apple-blossom weevil. The pests of the gooseberry described in detail comprise the dot moth, magpie moth, red spider, gooseberry and currant sawfly, "allied" sawfly, and gooseberry and currant scale. Growers of the

strawberry—to take one other illustration—will find ample space devoted to the ravages of ground beetles ('bat beetles'), cockchafers, golden chafers, strawberry-leaf beetles, button moths, garden swift moths, and eelworms.

Inasmuch, however, as some pests pay their unwelcome attentions to more than one of our cultivated fruits, the author has still further given the grower a helping hand by providing at the end of the volume an alphabetical list of fruit crops with the names of the insect pests of each one. Thus, although the dreaded winter moth, *Cheimatobia brumata*, is appropriately described amongst the insects that more especially attack the plum, it is nevertheless mentioned, in the list referred to, under the heads of apple, cherry, currant, gooseberry, and pear, all of which, particularly the first named, are liable to its attacks.

In a few cases Miss Ormerod has gone outside the class Insecta. This was desirable from the circumstance that several minute animal pests, other than insects, are capable of causing considerable loss to the fruit-grower. The notorious red spider and other arachnids, such as the gall mite of the black currant bush, thus receive attention, as does also the leaf-blister mite of the pear. In like manner the lowly organised eelworm which is associated with the "cauliflower disease" of the strawberry is brought under notice. Farmers are familiar with the ravages of eelworms in the case of such disorders as "stem-sickness" in clover and "tulip root" in oats.

With this handbook as a guide, the fruit-grower—whether he be a cultivator on an extensive scale, as in an orchard, or only to the modest degree compatible with the moderate limits of a kitchen garden—will find himself constantly on the alert as to impending attacks of insect pests. By warding these off on the one hand, and by promptly suppressing them when they occur on the other, he will have the satisfaction of obtaining from his fruit-trees a more substantial return than would otherwise be the case.

Several illustrations from the volume are here reproduced with the author's permission.

W. FREAM.

13 Hanover Square, W.

RECENT AGRICULTURAL INVENTIONS.

The subjects of Applications for Patents from December 10, 1898, *to March* 11, 1899.

N.B.—Where the Invention is a communication from abroad, the name of the Inventor is shown in italics, between parentheses, after the name of the applicant.

Agricultural Machinery and Implements, &c

No. of Application. Year 1898.	Name of Applicant.	Title of Invention.
26872	DOBSON, C.	Distributing manure.
3719	REDFERN, G. F. (*Peacock, Victoria*)	Rotary disc ploughs.

No. of Application. Year 1899.	Name of Applicant.	Title of Invention
348	ZIMMERMANN, E. J.	Adapting grass-mowing machines to mow cereals.
858	BALL, T., & anr.	Device for straw trussing.
1650	STANFORD, C. M.	Hulling cylinder for seed threshers.
2138	BANNISTER, G.	Knives for chaff-cutters.
2251	POPE, W.	Controlling coulters of corn drills, &c.
2300	SPOONER, A. F.	Mowing machine.
2432	PACKWOOD, S., & anr.	Chaff-cutting machines.
2651	SHARPE, W. T	Cultivator.
3014	DE LUCA, G. V.	Ploughs.
3019	COOK, J.	Knives for chaff-cutters.
3494	BLACKSTONE, E. C.	Lifting and loading cut crops.
3516	SMITH, W.	Chaff-cutters.
3530	ADAMSON, W. H.	New knife for hay-cutting machine.
3561	LAKE, H. H. (*Deering Harvester Co., U.S.A.*)	Harvesting machines.
3730	GASCOIGNE, T. P	Reaping and self-tying machines.
3834	NELSON, J. H.	Regulating plough furrows.
4151	LARK, F.	Killing weeds.
4266	THOMPSON, H.	Hoe.
4277	PEART, A. A.	Hoes and rakes.
4386	GARFITT, C.	Cultivators, harrows, &c.
4424	GOSS, J. P., & anr.	Apparatus for planting, manuring, and covering up potatoes.
4459	SCHUCKMANN, H. F.	Rakes, harrows, &c.
4735	FOWLER, R. H., & anr.	Balance ploughs.
4916	HIRST, W. W.	Machine for digging potatoes.
4921	RASMUSSEN, L. P.	Haystacking machines.
5101	COLEMAN, G. H., & another	Cultivator.
5108	PRITCHARD, E. C.	Ploughs.
5316	COOK, A. J.	Drills.
5258	DALE, W.	Sheaf-binding harvesters.

Stable Utensils and Fittings—Horse-shoes, &c.

Year 1898.		
26624	SULLIVAN, Sir A.	Releasing horses from vehicles.
26950	CLARKE, J., & anr.	Safety stirrups.
26958	MACMUNN	Horse-shoes.
27054	DONNELLY, A.	„
Year 1899.		
122	EDWARDS, E. (*Dallemagne, France*)	Horse-collars.

No. of Application. Year 1899.	Name of Applicant.	Title of Invention.
291	MACALISTER, J.	Stopping runaway horses.
321	WINDRIDGE, W.	Nailless horse-shoe.
599	DAWS, G.	Nosebags.
642	CLARKE, C. H.	Saddle-cloths.
788	ROBERTS, H. O.	Horse-shoes.
1123	TILL, O.	Nosebags.
1196	LAYCOCK, W. S.	Horse-shoe pads.
1251	HOWE, W. R.	Horse-shoes.
1290	MORRILL, A.	Rein-holder.
1356	KLEE, R., & WEZEL, J.	Horse-shoes.
1364	KEMP, J.	Adjustable horse-shoe.
1420	SMITH, E. H. L. (*Smith, G., India*)	Saddles and harness.
1599	MCCULLUM, C.	Friction-plate for collars.
1871	MCCAFFREY, J.	Saddles.
2054	WINCER, C.	Loop for hame and shaft tugs.
2099	NEAL, E.	Nosebags.
2196	LEMON, J. G.	Horse-shoes.
2237	WILTON, H. S.	Pummels for side saddles.
2295	BRIGG, T. H.	Connecting horses to vehicles.
2609	PAGE, J. A.	Shaft tugs.
2611	DAWSON, J.	Horse-shoes and detachable studs.
2619	GEDDES, D., & anr.	India-rubber horse-shoe pad.
2670	SAMMASSA, L.	Horse-shoes.
3030	HOWELL, A.	Stopping runaway horses.
3053	WESTGATE, W.	Preventing "clicking" of horses' shoes.
3078	DOCKING, S. R.	Nosebag and water-bucket combined.
3181	FERDINANDEZ, A. von.	Disengaging runaway horses.
3195	THOMPSON, W. P. (*Michelet, C. F., Norway*).	Horse-shoes.
3214	FITZROY, E. M.	Cross saddle-trees.
3288	WOOD, A., & another	Harness.
3502	SMITH, W.	Saddle-tree release bar.
3631	CHATWIN, A.	Nosebags.
3690	DREW, J., & others.	Horse-shoes.
3703	BENNETT, S.	Nosebags.
3722	DODGEON, W.	Nosebags.
3829	KUNTZE, F. O.	Horse-shoe calks.
4130	MEWBURN, J. C. (*Lawrence O. L. Ceylon*)	Bits.
4295	SAUER, D.	Spurs.

No. of Application.	Name of Applicant.	Title of Invention.
Year 1898.		
4301	WILLMORE, C. H. .	Saddle-trees.
4378	BRYANT, A. G. . .	Horse-shoes.
4437	PRESCOTT, S. J. . .	Traces.
4527	REVELL, R., & anr. .	Horse-shoes.
4578	THOMPSON, J. . .	Saddles.
4701	WOODS, H. B., & anr .	Device to prevent kicking.
4875	BISCHOFF, B., & anr. .	Stirrups.
5148	DAVEY, M. C. . .	Combined feed and water-trough.
5222	HUSSON, A.. . .	Horse-shoes.
5378	LEMON, J. G. . .	Horse-shoes.

Carts and Carriages.

Year 1899.		
4935	PARKER, H. . .	Waggon brakes.
4939	HITCHCOX, E. J. .	Device for cart-door.
4993	ROWE, G. . . .	Carts, waggons, &c.

Dairy Utensils, &c.

Year 1898.		
26425	AUSTIN, R . .	Apparatus for churning milk.
27253	SCRUBY, E. . .	Cutting cheese.
Year 1899.		
34	FRUHLING, B. . .	Stoppers for churns, &c.
769	MULLER, C. . .	Acidification of milk used in manufacture of margarine.
815	DRAKE, L. . . .	Churns.
927	MARSDEN, A. . .	Rolling and working butter.
2363	SHARPLES, D. T. .	Combined churn and butter worker
2563	SIEMOGLÜSS, G. & anr.	Milking apparatus and process
2564	SIEMOGLÜSS, G., & anr.	Milking machine.
2661	BECHTOLSHEIM, C. F. von, . . .	Milking apparatus.
2813	HILLIER, A. R. . .	Cheese cutter.
2914	ARNDT, O. . .	Machine for making butter.
3261	KEMISH, S. W., & anr.	Churns.
3482	BYRNE, P. (*Hillyard, Canada*). . .	Churns.
3983	NIELSEN, N. C. . .	Cans for transport of milk.
4711	NEISSE, J. H., & BOLL, J. . . .	Producing margarine.
5362	FROST, A. E. . .	Bottles for containing milk

Poultry and Game, &c., Appliances.

Year 1898.		
26916	KÖCHE, F. . . .	Incubators.
27256	BENNETT, J. A. . .	Rearing birds.

No. of Application. Year 1899.	Name of Applicant.	Title of Invention.
87	DUCKERING, S.	Incubators.
2836	BROOKS, J. R.	Apparatus for rearing chickens.
3632	NOKES, C. F.	Preserving eggs.
4160	SIMMINS, S.	Foster-mothers.
4197	SHEPHERD, W.	Incubator.
4949	MACKINTOSH, I. B. & L. A.	Incubators and foster-mothers.

Miscellaneous.

Year 1898.		
27330	NEWTON, P, A. (*Dixon, New South Wales*)	Sheep-shearing machine.
27356	MELCHIOR, A.	,, ,,
27385	BECKER, E.	,, ,,
27635	KIRBY, J.	Artificially feeding bees.
Year 1899.		
1371	MILES, C.	Electrically governed feeding and drinking appliance.
3828	AMMON, J.	Feeding apparatus for sucking animals.
4583	SCUDAMORE, H.	Hurdles.

Numbers of Specifications relating to the above subjects published since Dec. 10, 1898.[1]

(Price 8*d*. each copy.)

Specifications of 1897.

30, 3363, 6556, 2997.

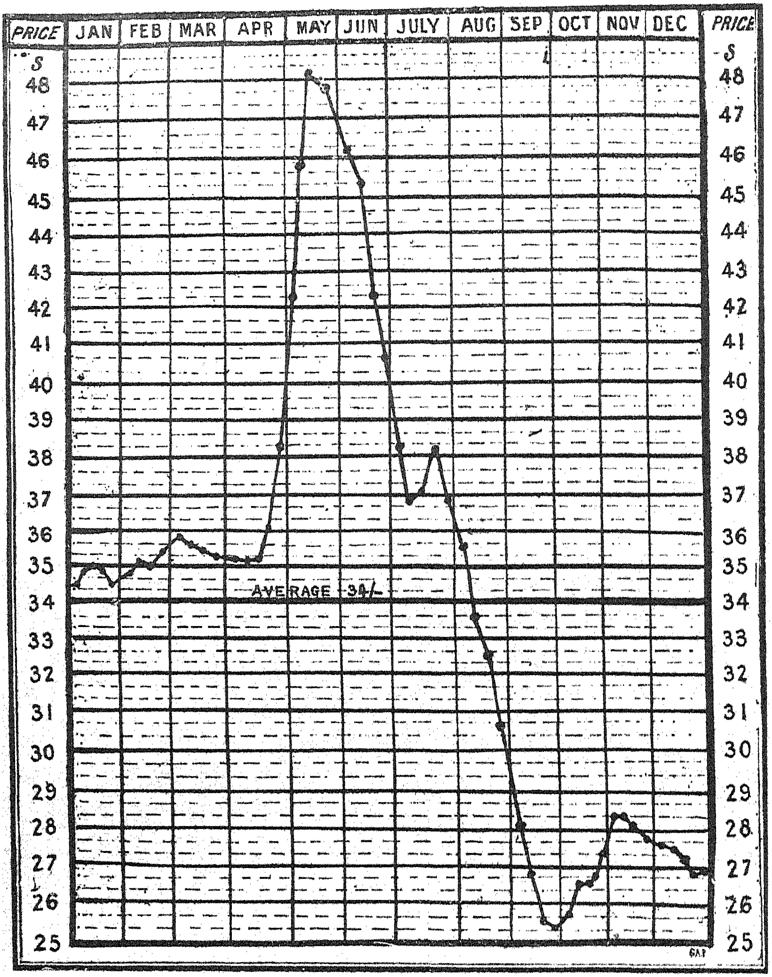
Specifications of 1898.

322, 1060, 1575, 1998, 2170, 2201, 2241, 2640, 2870, 3743, 3765, 3845, 4319, 4541, 4548, 4602, 4681, 5411, 5510, 5797, 5828, 5979, 5602, 6312, 6459, 6528, 6895, 7226, 7311, 7371, 7417, 7796, 8033, 8154, 8802, 8851, 9191, 9259, 9363, 9666, 9827, 10698, 13150, 13335, 16437, 17952, 18199, 18873, 19123, 21066, 22055, 22851, 23631, 24322, 24618, 24512, 24658, 24816, 24860, 25498, 25727, 26938, 27385, 27510.

[1] Copies may be obtained at the Patent Office (Sale and Store Branch), Quality Court, Chancery Lane, London, E.C.

1898.—Weekly Average Price of **WHEAT** from Government Returns.

(Each space between the lines of the diagram represents four pence.)



THE diagram given above shows the Imperial average price of *Wheat* in the year 1898 to have been 34*s.*, a rise of 3*s.* 10*d.* a quarter as compared with 1897. The highest weekly average was 48*s.* 1*d.* on May 21, and the lowest 25*s.* 5*d.* on September 24, being a fluctuation of 22*s.* 8*d.* a quarter, whereas in 1897 the fluctuation was 7*s.* 10*d.* a quarter. No fluctuation in the price of wheat equal to that of last year has taken place since 1868, when the fluctuation amounted to 25*s.* 2*d.*, the highest and lowest weekly prices in that year being 74*s.* 7*d.* and 49*s.* 5*d.* respectively, and the average price 63*s.* 9*d.* a quarter.

It may be added that the average price of *Barley* in the past year was 27*s.* 2*d.* a quarter, against 23*s.* 6*d.* in 1897, or a rise of 3*s.* 8*d.* a quarter. The average price of *Oats* in the past year was 18*s.* 5*d.* a quarter, which is 1*s.* 6*d.* a quarter higher than in 1897, the average in that year being 16*s.* 11*d.*

The foregoing values are per Imperial quarter—wheat, 480 lb.; barley, 400 lb.; oats, 312 lb.

Willich's tables state the septennial tithe-rent charge for 1899 to be 68*l.* 2*s.* 4¾*d.* for 100*l.*, or about ½ per cent. less than last year. The average for 63 years from the commencement in 1836 is 97*l.* 0*s.* 7¾*d.*

STATISTICS AFFECTING BRITISH AGRICULTURAL INTERESTS.

TABLE I.—*Average Prices of* **British Corn** *per Quarter (Imperial Measure), as received from the Inspectors and Officers of Excise conformably to the Act of* 45 *&* 46 *Vict. ch.* 37, *in each Week of the Year* 1898.

[*Compiled from the " London Gazette."*]

Week ending	Wheat		Barley		Oats		Week ending	Wheat		Barley		Oats	
1898	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	1898	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
January 1 .	34	6	27	3	17	1	July 2 . .	38	3	23	4	20	8
January 8 .	34	11	27	9	16	10	July 9 . .	36	10	25	0	20	5
January 15 .	35	0	27	8	17	4	July 16 . .	37	1	24	1	20	10
January 22 .	34	11	27	10	17	5	July 23 . .	38	1	25	0	20	10
January 29 .	34	6	27	8	17	2	July 30 . .	36	11	24	2	20	11
February 5 .	34	10	28	0	17	6	August 6 .	35	7	26	11	20	7
February 12 .	35	1	27	8	17	5	August 13 .	33	8	27	5	20	9
February 19 .	35	0	27	11	17	8	August 20 .	32	7	24	4	19	11
February 26 .	35	5	27	6	17	10	August 27 .	30	7	27	6	19	3
March 5 . .	35	10	28	0	17	11	September 3 .	28	1	27	8	18	11
March 12 .	35	8	27	10	17	9	September 10 .	26	10	27	9	17	10
March 19 .	35	6	28	0	17	10	September 17 .	25	7	26	10	16	10
March 26 .	35	4	28	6	17	8	September 24 .	25	5	26	9	17	1
Average of Winter Quarter	35	1	27	9	17	5	Average of Summer Quarter	32	8	25	10	19	7
April 2 . .	35	3	27	11	17	10	October 1 .	25	9	27	0	16	7
April 9 . .	35	2	27	0	17	11	October 8 .	26	6	27	5	16	7
April 16 . .	35	3	28	0	18	2	October 15 .	26	6	27	11	16	6
April 23 . .	36	1	28	3	18	4	October 22 .	26	8	28	1	16	6
April 30 . .	38	4	27	10	18	11	October 29 .	27	4	28	8	16	8
May 7 . .	42	4	27	8	20	4	November 5 .	28	4	28	6	17	2
May 14 . .	45	11	27	1	21	1	November 12 .	28	4	28	7	17	5
May 21 . .	48	1	26	0	21	3	November 19 .	28	1	28	5	17	2
May 28 . .	47	9	26	5	21	5	November 26 .	27	9	28	4	17	1
June 4 . .	46	3	26	10	21	0	December 3 .	27	7	28	6	17	1
June 11 . .	45	4	25	8	20	11	December 10 .	27	6	28	6	17	3
June 18 . .	42	4	26	1	20	5	December 17 .	27	2	28	5	17	0
June 25 . .	40	8	24	3	20	7	December 24 .	26	9	28	6	17	0
							December 31 .	26	11	28	4	17	0
Average of Spring Quarter	41	5	26	10	19	10	Average of Autumn Quarter	27	2	28	2	16	11

TABLE II.—*Annual Average Prices and Quantities of* **British Corn** *sold in the Towns in England and Wales from which Returns are received under the Act of* 45 *&* 46 *Vict. ch.* 37, *in each of the Years* 1889 *to* 1898.

[*From the "London Gazette."*]

Year	Wheat	Barley	Oats	Wheat	Barley	Oats
	s. d.	*s. d.*	*s. d.*	Qrs.	Qrs.	Qrs.
1889	29 9	25 10	17 9	2,945,408	3,329,814	415,783
1890	31 11	28 8	18 7	3,439,699	3,327,991	599,033
1891	37 0	28 2	20 0	3,248,743	3,255,518	561,713
1892	30 3	26 2	19 10	3,052,879	3,493,634	492,166
1893	26 4	25 7	18 9	2,620,060	3,366,056	575,522
1894	22 10	24 6	17 1	1,956,824	2,729,348	565,747
1895	23 1	21 11	14 6	1,928,383	3,426,576	665,939
1896	26 2	22 11	14 9	2,111,021	3,391,862	655,153
1897	30 2	23 6	16 11	2,756,561	3,257,187	550,434
1898	34 0	27 2	18 5	2,602,416	3,653,657	688,064

TABLE III.—*Returns published pursuant to the Corn Returns Act*, 1882, *and to Act of* 6 *&* 7 *Wm. IV. for "Commutation of Tithes in England and Wales," showing what has been, during the Seven Years ending Christmas Day in each Year, the Average Price of an Imperial Bushel of* **British Wheat, Barley,** *and* **Oats,** *computed from the Weekly Averages of Corn Returns in each of the Years* 1892 *to* 1898.

[*From the "London Gazette."*]

Year	Average (Septennial) Prices per Bushel		
	Wheat	Barley	Oats
	s. d.	*s. d.*	*s. d.*
1892	4 0	3 4¼	2 3¼
1893	3 11	3 4	2 3¼
1894	3 9	3 4	2 3½
1895	3 7	3 2¾	2 3
1896	3 6¼	3 2	2 2¼
1897	3 5¾	3 1	2 2
1898	3 5¼	3 0¾	2 1¾

TABLE IV.—*Average Prices of* **Wool** *in each of the Years* 1892 *to* 1898.

Year	ENGLISH[1]				AUSTRAL-ASIAN	SOUTH AFRICAN
	Leicester	Half-breds	Kent	Southdown		
	Per lb. *d.* *d.*	Per lb. *d.* *d.*	Per lb. *d.* *d.*	Per lb. *d.* *s.* *d.*	Per lb. *d.*	Per lb. *d.*
1892	8½ to 9	9¾ to 10¼	9¼ to 9¾	10½ to 1 0½	9	9½
1893	8½ „ 9¼	9½ „ 10¼	9 „ 9¾	10½ „ 1 0	8¾	9¼
1894	9 „ 10	9½ „ 10¾	9¼ „ 10¼	9¾ „ 1 0	8½	9¼
1895	9½ „ 10½	9¼ „ 11	9½ „ 10¾	9½ „ 0 11½	8	9¼
1896	9¾ „ 11	9¼ „ 10¾	9¼ „ 10¾	9¼ „ 0 11¼	8¾	7¾
1897	8¾ „ 10	8¾ „ 9¾	8½ „ 9¾	8¾ „ 0 10½	8¼	7½
1898	8 „ 8¾	7¾ „ 8¾	7½ „ 8½	8¼ „ 0 9¾	8½	7¾

[1] The prices of English wool have been calculated from the list given weekly in the *Economist*.

TABLE V.—*Number and Value of* **Live Cattle, Sheep,** *and* **Swine** *Imported into the United Kingdom in the Years* 1896, 1897, *and* 1898.

[*From Trade and Navigation Returns.*]

		Number			Value		
		1896	1897	1898	1896	1897	1898
					£	£	£
Cattle	From Channel Islands	1,719	1,633	1,814	32,106	31,018	34,785
	„ Canada . .	101,591	126,495	108,106	1,607,899	2,045,209	1,774,760
	„ United States .	393,119	416,299	369,478	6,735,519	7,230,854	6,238,984
	„ Argentine Republic .	65,699	73,852	89,368	923,638	1,153,507	1,351,261
	„ Other Countries	125	12	. .	5,893	378	. .
	Total . .	562,553	618,321	569,066	9,305,055	10,460,996	9,399,793
Sheep and Lambs	From Canada . .	83,767	63,761	42,070	125,956	95,602	63,286
	„ United States .	266,760	186,755	147,021	405,803	272,421	219,706
	„ Argentine Republic .	339,381	345,217	430,075	501,712	528,607	637,388
	„ Other Countries	79,684	15,771	44,583	100,163	22,466	64,483
	Total . .	769,592	611,504	663,749	1,133,634	919,096	984,863
Swine (not separately enumerated)		4	. .	450	10	. .	1,020
TOTAL VALUE OF LIVING ANIMALS		. .	. .	. .	10,438,699	11,380,092	10,385,676

TABLE VI.—*Quantity and Value of* **Fruit, Vegetables,** *and* **Hops,** *Imported into the United Kingdom in the Years* 1896, 1897, *and* 1898.

[*From Trade and Navigation Returns*]

	Quantity			Value		
	1896	1897	1898	1896	1897	1898
	Bushels	Bushels	Bushels	£	£	£
Apples	6,176,956	4,199,971	3,458,646	1,582,495	1,187,303	1,107,058
Cherries	219,367	312,294	401,810	105,811	178,131	230,828
Plums	560,245	1,043,819	922,212	241,782	497,783	434,666
Pears	483,823	1,051,877	491,649	206,674	377,900	221,772
Grapes	883,244	993,713	1,135,759	442,828	495,017	549,513
Oranges and Lemons . .	8,890,887	10,346,121	8,905,946	2,369,645	2,677,070	2,425,446
Unenumerated . . .	1,427,105	1,725,116	2,157,132	590,766	695,159	870,711
Onions	6,086,905	6,108,924	6,002,515	681,949	760,560	792,907
	Cwt.	Cwt.	Cwt.			
Potatoes	2,214,627	3,921,205	6,752,728	907,975	1,200,328	1,913,912
Vegetables, Raw, unenum'd .	. .	. .	. .	1,281,753	1,456,701	1,680,731
Hops	207,011	161,151	244,136	591,582	524,297	1,030,140
TOTAL VALUE OF FRUITS, &C	. .	. .	. .	9,006,260	10,050,249	11,257,687

TABLE VII.—*Quantities and Values of* **Animals for Food,** *and of* **Corn, Meat, Dairy Produce, Poultry,** *and* **Eggs,** *Imported into the United Kingdom in the Years* 1896, 1897, *and* 1898.

[*From Trade and Navigation Returns.*]

—	Quantities 1896	Quantities 1897	Quantities 1898	Values 1896	Values 1897	Values 1898
ANIMALS, LIVING (for food):—	No.	No.	No.	£	£	£
Cattle	562,553	618,321	569,066	9,305,055	10,460,996	9,399,793
Sheep and Lambs	769,592	611,504	663,749	1,133,634	919,096	984,863
Swine	4	...	450	10	...	1,020
TOTAL VALUE	...	...	...	10,438,699	11,380,092	10,385,676
CORN:—	Cwt.	Cwt.	Cwt.	£	£	£
Wheat	70,025,980	62,740,180	65,228,330	21,678,989	23,363,503	26,136,620
Wheat Meal and Flour	21,320,200	18,680,669	21,017,109	9,227,873	9,599,656	11,545,343
Barley	22,477,322	18,958,720	24,457,004	5,709,531	4,681,074	6,791,472
Oats	17,586,730	16,116,810	15,577,900	4,226,317	4,038,813	4,383,457
Peas	3,018,657	2,820,135	2,179,062	852,634	771,055	689,899
Beans	3,102,990	2,840,050	2,293,346	837,417	762,275	670,159
Maize	51,772,100	53,785,380	57,169,292	9,422,539	9,188,708	11,282,310
Oatmeal	554,750	732,495	989,480	330,966	434,672	615,925
Maize Meal	368,100	1,029,301	1,453,800	123,313	261,120	379,485
Other kinds of Corn and Meal	...	...	...	390,504	478,598	404,588
TOTAL VALUE	...	...	...	52,800,083	53,579,474	62,899,258
MEAT:—	Cwt.	Cwt.	Cwt.	£	£	£
Beef, Salted	247,536	174,936	208,945	303,700	215,901	273,004
„ Fresh	2,659,700	3,010,387	3,100,221	5,028,828	5,783,667	5,915,615
Mutton, Fresh	2,895,158	3,193,276	3,314,003	4,718,546	4,827,868	4,902,183
Bacon	4,549,526	5,004,915	5,711,322	7,854,515	8,867,846	10,321,674
Hams	1,459,412	1,725,875	1,972,052	3,136,089	3,681,966	3,894,839
Pork, Salted (not Hams)	255,339	237,206	276,044	291,966	253,693	319,858
„ Fresh	299,411	347,617	557,511	687,241	765,128	1,165,300
Meat, unenumerated—Salted or Fresh	279,390	364,822	414,977	554,064	727,273	812,767
Meat preserved otherwise than by Salting	701,750	669,684	573,947	1,775,507	1,702,315	1,801,276
Rabbits (dead)	170,873	276,458	314,398	401,614	543,494	572,603
TOTAL OF DEAD MEAT	13,518,095	15,005,176	16,443,420	24,752,070	27,369,151	29,979,119
DAIRY PRODUCE:—	Cwt.	Cwt.	Cwt.	£	£	£
Butter	3,037,718	3,217,802	3,209,093	15,344,364	15,916,917	15,960,571
Margarine	925,934	936,543	899,875	2,498,425	2,485,370	2,383,774
Cheese	2,244,525	2,603,178	2,339,452	4,900,342	5,885,521	4,970,247
Milk, Condensed	611,335	756,243	817,268	1,170,352	1,398,363	1,435,913
TOTAL OF DAIRY PRODUCE	6,819,512	7,513,766	7,265,688	23,913,483	25,686,171	24,750,505
POULTRY, &c.:—						
Poultry and Game, alive or dead	...	...	...	£ 705,478	£ 730,725	£ 636,488
Eggs	Gt. Hunds. 13,245,011	Gt. Hunds. 14,031,754	Gt. Hunds. 14,424,582	4,184,656	4,356,807	4,456,123
TOTAL VALUE	...	...	...	4,890,134	5,087,532	5,092,611

TABLE VIII.—*Quantities and Values of* **Dead Meat** *Imported into the United Kingdom in the Four Years* 1895 *to* 1898.

[*From Trade and Navigation Returns.*]

Thousands ("000") omitted.

DEAD MEAT	1895		1896		1897		1898	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	Cwt.	£	Cwt.	£	Cwt.	£	Cwt.	£
BACON:— From United States	2,649	4,586	2,752	4,067	3,593	5,354	4,087	6,438
" Denmark	1,014	2,505	1,222	2,792	1,027	2,744	1,018	2,701
" Canada	269	501	457	696	290	523	536	996
" Other Countries	131	334	119	300	95	247	71	187
Total	4,063	7,926	4,550	7,855	5,005	8,868	5,711	10,322
BEEF:— Salted — From United States	212	275	241	295	172	212	201	267
" Other Countries	8	12	7	9	3	4	5	6
Total	220	287	248	304	175	216	209	273
Fresh — From United States	1,649	3,450	2,075	4,216	2,242	4,609	2,302	4,677
" Other Countries	542	825	585	813	768	1,175	798	1,238
Total	2,191	4,276	2,660	5,029	3,010	5,784	3,100	5,916
HAMS:— From United States	1,203	2,697	1,286	2,758	1,604	3,412	1,852	3,651
" Canada	82	186	169	365	119	260	117	233
" Other Countries	5	14	4	12	3	10	3	10
Total	1,290	2,898	1,459	3,136	1,726	3,682	1,972	3,895
MEAT, Unenumerated:— Salted or Fresh — From Holland	151	321	163	345	225	472	250	518
" United States	37	66	61	99	76	127	90	157
" Other Countries	49	104	56	110	64	129	75	139
Total	237	491	279	554	365	727	415	813
Preserved, otherwise than by Salting — Beef	471	1,164	402	1,054	373	1,000	281	1,018
Mutton	200	335	123	202	99	161	118	195
Other Sorts	185	541	177	520	198	541	174	588
Total	856	2,040	702	1,776	670	1,702	574	1,801
MUTTON, Fresh:— From Holland	167	371	229	516	267	592	266	585
" Australasia	1,671	3,107	1,853	3,105	2 009	3,040	1,934	2,941
" Argentine Republic	715	1,000	802	1,072	909	1,175	1,106	1,358
" Other Countries	58	118	11	25	9	20	8	19
Total	2,611	4,596	2,895	4,719	3,193	4,828	3.314	4,902
PORK:— Salted (not Hams) — From United States	123	170	138	176	141	168	175	225
" Other Countries	97	100	118	116	96	86	101	95
Total	220	270	255	292	237	254	276	320
Fresh — From Holland	246	569	244	557	226	489	223	474
" Belgium	27	67	39	98	37	93	35	88
" Other Countries	15	29	16	32	85	184	300	603
Total	288	665	299	687	348	765	558	1,165
RABBITS:— From Belgium	86	234	92	251	84	227	85	229
" Other Countries	34	81	79	151	192	316	230	344
Total	120	316	171	402	276	543	314	573
TOTAL OF DEAD MEAT	12,098	23,763	13,518	24,752	15,005	27,369	16,443	29,979

TABLE IX.—*Quantities and Values of* **Butter, Margarine, Cheese, Milk, Poultry,** *and* **Eggs** *Imported into the United Kingdom in each of the Years* 1896, 1897, *and* 1898; *also Countries from which they were obtained.*

[*From Trade and Navigation Returns.*]

—	QUANTITIES			VALUES		
	1896	**1897**	**1898**	**1896**	**1897**	**1898**
BUTTER	Cwt.	Cwt.	Cwt.	£	£	£
From Sweden	323,829	299,214	294,962	1,664,685	1,515,705	1,501,668
,, Denmark . . .	1,228,784	1,334,726	1,465,030	6,288,413	6,748,163	7,359,831
,, Germany . . .	107,825	51,761	41,231	536,246	263,097	214,046
,, Holland . . .	234,469	278,631	269,324	1,156,726	1,353,349	1,329,438
,, France	467,602	448,128	416,821	2,537,695	2,330,576	2,183,845
,, New South Wales	7,777	23,835	34,391	37,691	112,218	167,616
,, Victoria . . .	154,865	169,075	124,223	769,695	816,399	605,611
,, New Zealand .	56,370	76,522	69,949	277,898	366,956	338,400
,, Canada	88,357	109,402	156,865	339,744	444,862	660,935
,, United States .	141,553	154,196	66,712	617,525	633,549	285,309
,, Other Countries .	226,287	272,312	269,585	1,118,046	1,332,043	1,313,872
Total	3,037,718	3,217,802	3,209,093	15,344,364	15,916,917	15,960,571
MARGARINE						
From Norway	10,158	10,827	8,477	28,102	29,785	22,799
,, Holland . . .	861,887	872,473	844,177	2,304,335	2,291,796	2,211,309
,, France	30,523	30,563	30,299	104,556	106,105	105,309
,, Other Countries .	23,366	22,680	16,922	61,432	57,684	44,357
Total	925,934	936,543	899,875	2,498,425	2,485,370	2,383,774
CHEESE						
From Holland	292,988	297,604	292,925	734,611	748,251	724,936
,, France	45,676	36,358	33,086	139,532	110,087	94,102
,, Australasia . .	55,149	68,615	44,608	115,479	161,776	91,161
,, Canada	1,234,297	1,526,664	1,432,181	2,589,301	3,349,501	2,943,725
,, United States .	581,187	631,616	485,995	1,234,037	1,413,079	1,006,588
,, Other Countries .	35,228	42,321	50,657	87,382	102,827	109,735
Total	2,244,525	2,603,178	2,339,452	4,900,342	5,885,521	4,970,247
MILK (condensed)	611,335	756,243	817,268	1,170,352	1,398,363	1,435,913
POULTRY (and Game)						
From Russia	...	...	...	143,584	186,825	164,498
,, Belgium . . .	...	...	...	143,388	164,179	127,927
,, France	...	...	...	302,902	256,113	217,703
,, Other Countries .	...	...	...	115,604	123,608	126,360
Total . . .	...	...	...	705,478	730,725	636,488
EGGS	Great Hundreds	Great Hundreds	Great Hundreds	£	£	£
From Russia	2,406,168	3,132,333	3,645,903	630,052	812,297	966,129
,, Denmark . . .	1,566,623	1,748,800	2,019,508	522,985	596,282	685,447
,, Germany . . .	2,930,486	2,971,846	2,821,128	782,121	813,022	788,844
,, Belgium . . .	2,243,909	2,464,182	2,349,902	694,322	768,077	729,876
,, France	3,275,776	2,675,667	2,115,096	1,273,200	1,022,869	817,336
,, Canada	500,317	568,769	745,355	178,931	193,998	251,710
,, Other Countries .	321,732	470,157	727,690	103,045	150,262	216,781
Total	13,245,011	14,031,754	14,424,582	4,184,656	4,356,807	4,456,123

TABLE X.—*Value of* Corn *and* Meal *Imported into the United Kingdom in each of the Five Years,* 1894 *to* 1898.

[*From Trade and Navigation Returns.*]

	1894	1895	1896	1897	1898
	£	£	£	£	£
Wheat . . .	18,760,505	22,531,176	21,678,989	23,363,503	26,136,620
Wheat Flour. .	7,994,673	7,679,013	9,227,873	9,599,656	11,545,343
Total . .	26,755,178	30,210,189	30,906,862	32,963,159	37,681,963
Barley . . .	7,090,579	5,538,405	5,709,531	4,681,074	6,791,472
Oats . . .	3,900,096	3,723,465	4,226,317	4,038,813	4,383,457
Maize . . .	7,952,238	7,808,860	9,422,539	9,188,708	11,282,310
Maize Meal . .	40,968	75,523	123,313	261,120	379,485
Peas . . .	1,346,096	693,828	852,634	771,055	689,899
Beans . . .	647,194	1,079,780	837,417	762,275	670,159
Oatmeal .	487,876	277,736	330,966	434,672	615,925
Other kinds of Corn and Meal		315,507	390,504	478,598	404,588
Total of Corn, &c.	48,220,225	49,723,293	52,800,083	53,579,474	62,899,258

TABLE XI.—*Quantities of* Wheat, *and of* Wheat Meal *and* Flour, *Imported into the United Kingdom in each of the Five Years,* 1894 *to* 1898; *also the Countries from which they were obtained.*

[*From Trade and Navigation Returns.*]

Thousands ("000") omitted.

	1894	1895	1896	1897	1898
WHEAT *from*—	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
Russia	16,776	23,017	17,242	15,050	6,232
Germany	715	753	1,033	1,333	711
Turkey	340	1,300	1,930	1,863	272
Roumania	108	2,022	5,401	1,221	184
United States.	24,658	27,084	30,695	34,603	37,804
Chile	1,764	1,039	1,936	1,019	807
Argentine Republic . .	13,272	11,400	4,928	933	4,035
British East Indies . . .	5,349	8,803	2,113	573	9,538
Australasia	3,877	3,487	7	. .	212
British North America .	2,829	1,845	3,618	4,821	5,012
Other Countries	438	1,000	1,124	1,324	421
TOTAL WHEAT . . .	70,126	81,750	70,026	62,740	65,228
WHEAT MEAL AND FLOUR *from*—	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
Germany	199	244	205	74	107
France	481	1,126	1,719	1,682	438
Austrian Territories . .	1,107	1,306	1,388	1,144	729
United States.	15,925	13,132	15,905	14,063	17,446
British North America .	1,195	2,343	1,933	1,531	1,969
Other Countries	227	218	170	187	328
TOTAL WHEAT MEAL AND FLOUR . . .	19,135	18,368	21,320	18,681	21,017

TABLE XII.—*Number of* **Horses, Cattle, Sheep,** *and* **Pigs** *Imported into Great Britain from Ireland in each of the Years* 1892 *to* 1898.

——	1892	1893	1894	1895	1896	1897	1898
HORSES:							
Stallions . . .	113	151	163	188	191	153	150
Mares	14,273	13,356	14,484	15,370	18,046	17,590	18,200
Geldings . . .	18,095	16,883	18,942	19,002	21,619	20,679	20,454
Total . .	32,481	30,390	33,589	34,560	39,856	38,422	38,804
CATTLE:							
Oxen, Bulls, and Cows — Fat .	256,538	316,344	330,748	302,555	274,472	259,173	278,770
Oxen, Bulls, and Cows — Store.	305,373	318,545	422,534	414,859	349,800	419,302	460,903
Oxen, Bulls, and Cows — Other Cattle .	6,278	8,473	7,805	5,622	3,837	5,043	4,101
Calves	56,268	45,307	65,867	68,571	53,451	62,494	59,588
Total. . .	624,457	688,669	826,954	791,607	681,560	746,012	803,362
SHEEP:							
Sheep	713,528	705,299	574,471	351,975	397,164	435,709	449,558
Lambs	366,674	402,661	382,630	300,603	340,142	368,806	383,900
Total. . .	1,080,202	1,107,960	957,101	652,578	737,306	804,515	833,458
PIGS:							
Fat	457,977	405,242	515,647	500,700	574,677	653,459	556,723
Store.	42,974	51,329	69,320	46,520	35,912	41,848	32,062
Total . .	500,951	456,571	584,967	547,220	610,589	695,307	588,785

TABLE XIII.—*Number of* **Horses,** *and their Declared Value, Imported into, and Exported from, the United Kingdom in each of the Years* 1893 *to* 1898.

[*From Trade and Navigation Returns.*]

Year	Imported		Year	Exported	
	Number	Value		Number	Value
		£			£
1893	13,707	376,819	1893	11,961	472,762
1894	22,866	548,058	1894	16,457	449,804
1895	34,092	921,490	1895	21,564	519,882
1896	40,677	1,027,736	1896	29,414	671,332
1897	49,519	1,254,362	1897	34,471	825,216
1898	42,921 [1]	1,145,328	1898	36,511	842,648

[1] NOTE.—The countries from which horses were *imported* in 1898 were as follow: United States, 25,328; Canada, 6,359; other countries, 11,234.

TABLE XIV.—*Numbers and Prices of* Live-stock *in* 1896, 1897, *and* 1898, *as returned under the Markets and Fairs (Weighing of Cattle) Act* 1891.

[*From Journal of the Board of Agriculture.*]

NUMBER OF ANIMALS reported as ENTERING THE SCHEDULED PLACES in Great Britain, together with the Numbers WEIGHED and the Numbers PRICED.

Animals	1896	1897	1898 [1]
CATTLE:	No.	No.	No.
Entering markets	1,100,014	1,115,183	1,263,991
Weighed	109,184	111,767	138,652
Prices returned	99,537	100,371	124,197
Prices returned with quality distinguished	75,014	78,329	102,299
SHEEP:			
Entering markets	4,309,943	4,194,310	4,691,619
Weighed	41,685	41,969	49,953
Prices returned with quality distinguished	35,048	36,692	40,460
SWINE:			
Entering markets	232,344	211,613	363,370
Weighed	4,585	2,333	1,614
Prices returned	1,686	1,368	1,437
Prices returned with quality distinguished	1,686	1,368	1,437

CALCULATED AVERAGE PRICE PER LIVE CWT. IN TWELVE SELECTED PLACES

(obtained by dividing the total price by the total weight of the weighed fat cattle, of all descriptions, in each of the three qualities or grades).

Places	Inferior or third quality		Good or second quality		Prime or first quality	
	1897	1898	1897	1898	1897	1898
	Per cwt. *s. d.*	Per cwt. *s. d.*	Per cwt. *s. d.*	Per cwt. *s. d.*	Per cwt. *s. d.*	Per cwt. *s. d.*
ENGLAND:						
Carlisle	—	25 10	—	29 10	—	32 10
Leeds	27 8	28 0	30 4	29 4	32 4	32 0
Liverpool	25 10	24 0	30 0	28 0	32 8	31 10
London	28 4	25 2	33 8	32 4	38 10	36 6
Newcastle	27 2	26 0	30 8	29 10	36 2	33 4
Shrewsbury	25 4	24 6	30 6	29 8	34 6	34 2
SCOTLAND:						
Aberdeen	24 8	23 10	33 0	31 8	36 0	34 8
Dundee	27 6	26 10	32 6	31 4	35 2	33 8
Edinburgh	—	28 10	33 10	32 8	35 8	34 0
Falkirk	—	28 2	—	31 10	—	34 0
Glasgow	30 8	31 0	32 10	32 2	35 10	33 10
Perth	31 4	30 2	33 10	32 4	35 10	34 8

[1] Includes the returns from Carlisle and Falkirk.

TABLE XV.—*Home Product and Importations of* **Sheep** *and* **Mutton** *(United Kingdom) in each Year from* 1885 *to* 1898.
[*From Messrs. W. Weddel & Co.'s "Review of the Frozen Meat Trade,* 1898," *corrected to date.*]

Year	Population at the middle of each year	Number of Sheep and Lambs enumerated annually in June (from *Agricultural Returns*)	Estimated Dead Weight of Sheep and Lambs slaughtered, say 40 per cent. of Total Number	Weight of Fresh Mutton and Lamb, and estimated Dead Weight of Sheep Imported
			Tons	Tons
1885	(estimated) *36,015,601*	30,086,200	322,000	47,355
1886	„ *36,313,582*	28,955,240	310,000	58,588
1887	„ *36,599,143*	29,401,750	315,000	63,527
1888	„ *36,881,271*	28,938,716	310,000	73,360
1889	„ *37,178,929*	29,484,774	316,000	78,235
1890	„ *37,484,764*	31,667,195	339,000	91,782
1891	(census) 37,704,283	33,533,988	359,000	91,762
1892	(estimated) *38,106,675*	33,642,808	360,000	86,974
1893	„ *38,440,249*	31,774,824	340,000	100,142
1894	„ *38,779,031*	30,037,818	322,000	127,917
1895	„ *39,166,821*	29,774,853	318,500	157,155
1896	„ *39,558,489*	30,853,809	329,000	164,000
1897	„ *39,954,073*	30,567,061	327,500	174,950
1898	„ *40,353,613*	31,102,359	333,000	184,000

TABLE XVI.—*Number of Tons of* **Frozen Mutton** *and* **Lamb** *Imported into the United Kingdom from the Countries named in each Year from* 1885 *to* 1898.

Year	From New Zealand	From River Plate	From Australia	Totals
	Tons	Tons	Tons	Tons
1885	14,200	5,611	2,678	22,489
1886	17,328	9,520	1,885	28,733
1887	19,782	12,563	2,122	34,467
1888	24,931	17,269	2,224	44,424
1889	28,425	19,765	2,105	50,295
1890	39,366	21,754	5,491	66,611
1891	44,806	21,818	8,366	74,990
1892	38,283	23,556	10,586	72,425
1893	45,015	25,780	14,357	85,152
1894	48,553	29,286	23,421	101,260
1895	58,552	36,406	25,266	120,224
1896	53,955	40,136	38,823	132,914
1897	65,116	45,431	35,338 [1]	145,885
1898	65,730	55,310	30,974 [1]	152,014

[1] Decrease owing chiefly to drought in New South Wales and Queensland.

TABLE XVII.—*Quantity and Value of* **Wool, Wood, Seeds, Manures, &c.,** *Imported into the United Kingdom in the Years* 1896 *to* 1898.

[*Compiled from Trade and Navigation Returns.*]

—	QUANTITY			VALUE		
	1896	**1897**	**1898**	**1896**	**1897**	**1898**
WOOL: Sheep and Lambs'	Lb. 713,575,173	Lb. 735,627,420	Lb. 689,346,799	£ 24,958,346	£ 24,436,871	£ 23,437,309
WOOD AND TIMBER:	Loads	Loads	Loads			
Hewn	2,432,790	2,825,665	2,335,302	4,889,374	5,780,639	4,900,618
Sawn or Split, Planed or Dressed	6,031,492	7,024,492	6,359,828	13,380,580	16,639,931	15,047,801
Staves	138,393	126,745	139,120	656,246	569,572	646,075
SEEDS:						
Clover & Grass	Cwt. 405,617	Cwt. 299,946	Cwt. 342,673	788,538	579,258	654,941
Cotton	Tons 368,419	Tons 412,876	Tons 430,432	1,729,509	1,925,351	2,069,111
Flax or Linseed	Qrs. 2,578,864	Qrs. 1,908,618	Qrs. 1,688,515	4,022,676	2,988,503	2,920,714
Rape	179,730	185,232	258,951	195,527	258,233	367,741
MANURES:						
Bones (burnt or not)	Tons 66,681	Tons 59,228	Tons 59,345	251,866	217,592	245,428
Guano	20,214	16,734	23,634	104,354	89,812	117,924
Nitrate of Soda	106,445	103,805	130,327	836,552	797,445	972,801
Phosphate of Lime & Rock	291,314	324,788	329,610	465,931	491,813	499,872
MISCELLANEOUS:						
Cotton, Raw	Cwt. 15,668,663	Cwt. 15,394,289	Cwt. 19,004,886	36,272,039	32,195,172	34,125,551
Hemp	1,834,360	1,780,380	1,888,840	1,951,506	1,763,402	2,308,480
Flax	1,903,980	1,976,040	1,945,040	3,117,316	3,203,184	2,932,621
Linen Yarn	Lb. 20,069,122	Lb. 15,907,161	Lb. 15,738,320	779,641	618,375	599,346
Hides, Raw:						
Dry	Cwt. 369,063	Cwt. 557,087	Cwt. 542,454	905,425	1,413,166	1,455,806
Wet	604,734	638,668	694,057	1,319,516	1,336,991	1,450,260
Leather	1,246,252	1,278,818	1,248,672	7,594,592	7,647,457	7,788,397
Petroleum	Gall. 189,953,945	Gall. 185,665,376	Gall. 219,250,539	3,732,056	3,335,271	3,733,630
Lard	Cwt. 1,739,463	Cwt. 1,740,468	Cwt. 2,106,870	2,268,693	1,993,143	2,887,774
Oil-seed Cake	Tons 316,073	Tons 336,898	Tons 391,247	1,589,214	1,834,729	2,284,244

TABLE XVIII.—*Summary of Agricultural Produce Statistics* (**Beans, Peas, Potatoes, Roots,** *and* **Hay**) *for England, Wales, Scotland, and Great Britain in* 1898 *and in* 1897.[1]

—	Estimated Total Produce 1898	Estimated Total Produce 1897	Area 1898	Area 1897	Estimated Yield per Acre 1898	Estimated Yield per Acre 1897	Average Yield per Acre 1888–97
BEANS.							
	Bushels	Bushels	Acres	Acres	Bushels	Bushels	Bush.
England .	6,692,000	6,124,000	217,310	213,539	30·83	28·71	26·54
Wales . .	36,000	30,000	1,285	1,460	28·25	20·74	25·04
Scotland .	472,000	449,000	13,412	13,913	35·26	32·30	31·47
Great Britain	7,200,000	6,603,000	232,007	228,912	31·07	28·88	26·79
PEAS.							
	Bushels	Bushels	Acres	Acres	Bushels	Bushels	Bush.
England .	4,783,000	5,168,000	173,007	187,432	27·69	27·64	25·76
Wales . .	34,000	35,000	1,569	1,723	21·87	20·35	19·09
Scotland .	32,000	36,000	1,325	1,501	25·47	24·96	24·18
Great Britain	4,849,000	5,239,000	175,901	190,656	27·62	27·56	25·70
POTATOES.							
	Tons	Tons	Acres	Acres	Tons	Tons	Tons
England .	2,256,000	1,896,000	365,432	352,365	6·17	5·38	5·97
Wales . .	185,000	166,000	32,797	32,609	5·62	5·10	5·64
Scotland .	842,000	546,000	126,362	119,940	6·66	4·55	5·56
Great Britain	3,283,000	2,608,000	524,591	504,914	6·26	5·17	5·85
TURNIPS AND SWEDES.							
	Tons	Tons	Acres	Acres	Tons	Tons	Tons
England .	13,083,000	17,106,000	1,237,011	1,287,664	10·58	13·28	12·89
Wales . .	1,012,000	1,114,000	68,176	70,349	14·84	15·84	14·90
Scotland .	7,242,000	7,432,000	467,279	475,132	15·50	15·64	15·00
Great Britain	21,337,000	25,652,000	1,772,466	1,833,145	12·04	13·99	13·50
MANGELS.							
	Tons	Tons	Acres	Acres	Tons	Tons	Tons
England .	6,064,000	6,480,000	342,962	345,372	17·68	18·76	17·38
Wales . .	129,000	126,000	7,854	7,842	16·39	16·07	16·11
Scotland .	25,000	22,000	1,455	1,374	18·04	16·04	16·50
Great Britain	6,218,000	6,628,000	352,271	354,588	17·65	18·69	17·35
HAY CUT FROM CLOVER, SAINFOIN, AND ROTATION GRASSES.							
	Tons	Tons	Acres	Acres	Cwt.	Cwt.	Cwt.
England .	3,034,000	2,434,000	1,779,341	1,692,612	34·09	28·75	27·48
Wales . .	285,000	248,000	199,959	196,251	28·52	25·26	22·58
Scotland .	688,000	638,000	402,251	397,102	34·21	32·13	31·06
Great Britain	4,007,000	3,320,000	2,381,551	2,285,965	33·65	29·04	27·76
HAY CUT FROM PERMANENT GRASS.							
	Tons	Tons	Acres	Acres	Cwt	Cwt.	Cwt.
England .	5,883,000	4,963,000	3,932,330	3,901,563	29·92	25·44	23·33
Wales . .	549,000	479,000	474,492	473,725	23·12	20·20	18·01
Scotland .	200,000	194,000	129,603	135,045	30·89	28·84	28·48
Great Britain	6,632,000	5,636,000	4,536,425	4,510,333	29·24	24·99	22·95

[1] A similar summary for Wheat, Barley and Oats in 1898 and in 1897 is given in the preceding number of the Journal, vol. ix. (part iv.) 1898, p. 808.

Rainfall, Temperature *and* **Bright Sunshine** *experienced over* **England** *and* **Wales** *during the whole of* **1898,** *with Average and Extreme Values for Previous Years.*

Districts	Rainfall: Total Fall: In 1898	For previous 32 years: Average	Extremes: Driest	Extremes: Wettest	No. of Days with Rain: In 1898	For previous 17 years: Average	Extremes: Driest	Extremes: Wettest
	in.	in.	in.	in.				
North-eastern counties	21·9	26·0	19·9 (1884)	37·2 (1872)	176	183	162 (1884)	208 (1894)
Eastern counties	20·3	25·5	19·1 (1874 and 1887)	33·1 (1872)	156	184	163 (1884)	205 (1894)
Midland ,,	22·0	28·1	19·2 (1887)	39·8 (1872)	162	180	148 (1887)	210 (1882)
Southern ,,	21·7	29·0	21·5 (1887)	41·7 (1872)	150	175	150 (1887)	197 (1882)
North-western counties, including North Wales	33·8	38·7	24·9 (1887)	59·2 (1872)	202	197	163 (1887)	222 (1882)
South-western counties, including South Wales	35·6	42·8	28·3 (1887)	68·6 (1872)	188	200	159 (1887)	235 (1882)
Channel Islands[1]	28·4	32·9	26·2 (1887)	39·5 (1882)	208	213	181 (1887)	251 (1886)

Districts	Mean Temperature: In 1898	For previous 32 years: Average	Extremes: Coldest	Extremes: Warmest	Hours of Bright Sunshine: In 1898	For previous 17 years: Average	Extremes: Cloudiest	Extremes: Sunniest
	°	°	°	°				
North-eastern counties	49·2	47·3	45·0 (1879)	48·8 (1868)	1237	1291	1006 (1885)	1558 (1893)
Eastern counties	50·0	48·3	45·8 (1879)	51·0 (1868)	1556	1540	1267 (1888)	1831 (1893)
Midland ,,	49·7	48·3	45·8 (1879)	51·1 (1868)	1387	1399	1173 (1888)	1715 (1893)
Southern ,,	51·6	49·4	46·9 (1879)	51·2 (1868 and 1893)	1535	1554	1245 (1888)	1875 (1893)
North-western counties, including North Wales	50·2	48·4	45·9 (1879)	50·3 (1868 and 1893)	1432	1330	1198 (1888)	1519 (1887)
South-western counties, including South Wales	51·4	50·2	48·3 (1888)	52·8 (1868)	1698	1647	1459 (1888)	1964 (1893)
Channel Islands[1]	53·9	51·9	50·7 (1885)	53·9 (1893)	1968	1909	1710 (1888)	2300 (1893)

Note.—The above Table is compiled from information given in the Weekly Weather Report of the Meteorological Office.

[1] For the Channel Islands the "Averages" and "Extremes" of Rainfall and Mean Temperature are for the previous seventeen years only.

The Rainfall of 1898 *and of the previous Ten Years, with the Average Annual Fall for a long period, as observed at thirty-eight stations situated in various parts of the United Kingdom.*

Stations	1898 Total Rainfall	1898 Difference from Average	1897	1896	1895	1894	1893	1892	1891	1890	1889	1888	Average[1] Rainfall
			Rainfall of Previous Years										
	In.	Per cent.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
ENGLAND AND WALES:													
Durham	20·8	−26	21·8	24·5	27·6	23·7	20·1	28·1	24·6	26·0	20·7	27·3	28·2
York	23·7	− 9	24·4	22·2	25·8	28·0	22·3	24·7	23·8	22·7	23·0	25·0	26·0
Stamford	19·1	−28	23·1	22·4	20·4	22·5	17·0	21·9	27·1	21·3	28·1	24·3	26·4
Yarmouth	20·9	−23	20·8	21·3	23·3	26·8	19·5	30·5	24·2	24·1	26·9	22·1	27·1
Cambridge	17·9	−23	20·4	20·7	22·8	23·0	21·4	25·7	26·0	17·9	26·4	20·0	23·3
Rothamsted	18·7	−35	25·0	29·0	25·4	29·6	23·8	23·8	30·5	23·5	29·1	27·2	28·6
Loughborough	20·0	−23	23·9	23·5	23·0	21·0	19·1	21·0	30·0	19·0	27·1	22·6	25·9
Cheadle	27·8	−18	32·8	29·3	29·5	27·2	27·4	31·3	35·7	28·5	30·8	28·7	34·0
Hereford	20·9	−23	26·7	18·2	24·1	29·2	18·9	21·3	27·5	18·2	25·2	28·5	27·1
Cirencester	22·1	−31	32·7	23·6	25·8	35·2	20·7	23·8	36·5	22·2	26·5	30·1	31·9
Oxford	19·1	−26	26·3	23·5	22·5	29·7	17·6	20·5	27·5	17·8	23·5	27·2	25·7
London	17·8	−28	23·3	22·7	21·4	28·7	19·2	23·0	28·1	22·8	24·7	26·7	24 8
Hastings	23·0	−22	28·1	29·9	28·6	35·8	27·2	26·9	30·6	29·1	26·9	31·7	29·5
Southampton	26·6	−15	32·6	26·3	28·3	34·9	23·5	23·9	38·8	26·4	25·4	31·8	31·3
Stonyhurst	47·9	0	51·3	44·2	42·4	50·5	50·7	48·3	46·9	50·2	42·6	41·0	47·9
Manchester	33·2	−12	39·1	38·4	34·2	39·2	31·9	42·4	39·9	33·9	34·7	34·0	37·8
Liverpool	25·6	−11	28·4	26·6	26·2	28·1	24·4	33·0	31·6	27·1	27·4	24·1	28·9
Llandudno	31·3	+ 1	30·7	30·4	30·1	29·1	26·6	33·5	32·8	28·2	28·5	25·9	31·1
Llandovery	47·5	− 5	50·1	41·8	41·4	55·3	40·0	36·7	58·6	46·0	41·0	49·9	50 2
Clifton	30·9	−12	38·9	27·6	32·0	40·6	28·9	26·4	42·5	24·9	30·5	34·5	35·2
Cullompton	29·9	−16	38·9	27·6	34·8	40·4	29·9	28·2	39·2	31·4	30·3	36·6	35·8
Plymouth	29·6	−19	40·4	29·1	37·7	42·5	31·0	28·9	39·8	36·6	33·8	37·0	36·6
Scilly (St. Mary's)	27·1	−20	35·7	25·8	29·9	38·0	26·5	28·1	36·9	32·4	27·8	29·3	34·0
Jersey (St. Aubin's)	30·0	−12	36·2	33·2	34·7	39·1	29·7	31·2	35·6	33·8	32·2	34·9	34·2
[2] Mean for the whole of England and Wales	26·2	−18	31·3	28·5	29·0	33·1	25·6	28·3	33·5	28·8	28·8	29·5	32·0
SCOTLAND:													
Wick	27·4	− 4	21·9	34·7	32·9	29·5	34·9	33·6	31·2	33·4	31·7	30·0	28·5
Aberdeen	27·5	−11	28·7	31·2	35·8	28·6	29·5	29·8	28·5	32·4	28·1	28·2	30·8
Braemar	36·5	+ 1	36·8	30·2	32·7	41·9	30·8	28·1	34·4	39·2	29·7	35·0	36·0
Leith	19·9	−15	20·5	21·7	21·9	26·1	19·2	20·6	22·6	26·0	20·0	21·3	23·4
Fort Augustus	54·2	+29	41·9	42·6	43·4	54·7	47·3	44·5	48·2	49·3	32·8	39·9	41·9
Fort William	102·4	+33	74·7	71·1	58·1	78·8	83·7	72·7	78·7	89·2	65·4	70·3	77·2
Glasgow	37·4	− 6	39·7	35·9	32·9	42·8	33·9	37·1	36·5	38·9	30·6	32·8	39·6
Glenlee	54·1	− 5	62·2	50·7	47·8	62·1	47·8	53·5	60·9	54·6	49·6	56·7	57·0
[2] Mean for the whole of Scotland	47·4	+17	41·5	43·7	39·7	45·6	42·8	41·5	44·5	46·9	36·8	40·3	40·4
IRELAND:													
Londonderry	41·3	+ 3	41·6	41·9	39·5	40·4	38·9	39·9	36·4	42·5	39·8	37·4	40·1
Markree Castle	40·4	− 2	46·1	42·3	38·4	44·3	36·2	41·8	38·6	40·8	43·5	41·1	41·3
Armagh	31·8	+ 2	35·1	31·2	30·5	33·1	24·3	32·5	28·8	30·1	30·7	29·6	31·2
Dublin	27·1	− 2	29·4	26·9	31·2	29·3	20·5	25·7	27·8	27·6	27·3	28·7	27·6
Parsonstown	34·2	+ 5	37·8	32·4	29·0	35·9	28·3	33·9	31·8	30·7	27·0	28·5	32·7
Kilkenny	29·1	−11	41·4	29·2	33·7	38·2	26·5	32·1	34·6	31·2	30·3	34·4	32·7
[2] Mean for the whole of Ireland	38·6	−2	44·5	38·0	36·8	40·8	33·3	39·1	38·4	40·1	38·1	38·4	39·4

[1] The Average Fall is in nearly all cases deduced from observations extending over the thirty years 1866–95.

[2] The Mean Rainfall for each country is based upon observations made at a large number of stations in addition to those given above.

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY

OF ENGLAND.

ABORTION, BARRENNESS, AND FERTILITY IN SHEEP:

AN ABSTRACT OF RECORDS OBTAINED FOR THE YEAR 1896-97.

INTRODUCTION.

IN July, 1897, in response to a request, the Royal Agricultural Society was kind enough to issue a circular to a large number of flockmasters, asking for information on the subject of abortion, barrenness, and fertility in their flocks for the season 1896–97. I am now further indebted to the courtesy of the Society, and would here gratefully acknowledge the obligation, for permission to publish the results of that work in their Journal.

The inquiry was made primarily for the purpose of finding out the amount of abortion and barrenness which flockmasters on the average experience, and at the same time of discovering the relative liability to loss from these causes in different breeds of sheep, and their relative fertility.

The information asked for did not include suggestions for the cure or prevention of abortion and barrenness, nor does this paper claim to supply satisfactory information on these points; a far more exhaustive inquiry is requisite for such a purpose. At the same time, during the progress of the work, certain possible causes, which may influence the proportion of abortion and barrenness experienced, have been suggested, and to some of these I have drawn attention in the following pages.

The issue of the request by the Royal Agricultural Society resulted in the return of 413 circulars with more or less informa-

tion entered thereon, and of these it was found possible to make use of 397, containing particulars of 122,673 breeding ewes.

The information asked for included, in the first place, particulars of the breeding flocks and their management, the ages of rams and ewes, the food given to them, and their condition; in the second place, particulars of their fertility, the number of lambs born, the number of twins, and the time of the birth of twins; and, in the third place, particulars of the number of ewes which aborted and which proved barren, the usual proportion of barren ewes, and the largest proportion experienced at any time.

To this was added, on the receipt of the circulars, particulars of the district in which each flock was run, the nature of the subsoil, rainfall, &c.

The circulars returned comprised particulars of 338 flocks of pure-bred and 59 flocks of cross-bred sheep, as detailed in Table I. Eight of these pure breeds were considered separately, namely, Suffolks, Kents, Southdowns, Hampshire Downs, Oxford Downs, Dorset Horns, Shropshires, and Lincolns; while each of the remaining ten pure breeds were represented by so few flocks that they were grouped together as "various pure breeds," this group consisting of Leicester, Border Leicester, Wensleydale, Cheviot, Ryeland, Cotswold, Herdwick, Scotch Black Face, Improved Welsh, and Roscommon sheep. The remainder were cross-bred in various ways.

During 1898 the statistical and other information supplied was worked out for each of these breeds and groups of breeds, and was further supplemented by information obtained by personal interviews with many flockmasters in different parts of the country.

It will be seen in Table I. that a different number of flocks, or of ewes, of each breed is concerned in the various calculations for that breed; this is not due to an arbitrary selection of flocks, but to the fact that all the flockmasters who sent information were unable to reply to all the questions asked, and on that account they could not all be included for every calculation.

The returns made for lambs, unfortunately, do not always represent the number born; in some cases flockmasters were unable to supply that information, and sent either the number "tailed" or the number alive at the time the circular was filled up. I have no definite information as to the mortality among lambs, and the reliability of this return, as a test of fertility, would be questionable, were it not for the return of twins born.

This latter return, when given, I find much more reliable, and by its help one is able to arrive at a fairly accurate idea of the correctness of the lambing return, and of the relative fertility of the different breeds. This point will be further explained in the section devoted to Fertility.

Another element of error should not be lost sight of, and that is with regard to abortion. When abortion occurs at an early period of gestation it may escape the notice of the shepherd. Some ewes which abort may not again come in season, others may be already drafted into a flock in which there is no ram; in either case, if abortion is not noted, these ewes are wrongly returned as barren, and it is impossible to avoid this error. Therefore it is probable that the proportion of barren ewes may be put down too high, and the proportion of aborted ewes too low in these returns; but at the same time I am convinced the error is not, as a rule, a large one.

The percentages given in Table I. are worked out with reference to the total ewes concerned, and not with reference to the flocks. On the whole, the individual experience of the majority of flockmasters is slightly more favourable than is shown by the percentages given, and that is due, no doubt, to the fact that large flocks, generally, suffer more losses than small flocks. The difference, as a rule, is very slight, and is hardly worth considering, but mention is made of it because I do not doubt some flockmasters will be surprised to learn what is the average percentage of loss from aborted and barren ewes.

The numbers given of the proportion of barren ewes usually experienced show that the percentage of barrenness arrived at for 1896–97 is in no way unusual for any of the breeds, while the records of the highest percentage of loss from barrenness experienced at any time conclusively prove that excessive barrenness—from 20 to 50 per cent., and even more—may be experienced at one time or another by many flockmasters of any breed of sheep.

Details of the loss of ewes during gestation and at lambing time have not been obtained. It is not easy to acquire this information; but from inquiries I have made I have strong reason for thinking that, taking one year with another, for all pure-bred flocks, not less than 3 per cent. of ewes die per annum. When this loss is added to the percentage of loss from abortion and barrenness, it will be seen that flockmasters of pure-bred sheep, on an average, have at least 10 per cent. of ewes which die or prove unremunerative as breeders each year.

The cross-bred flocks, of which particulars were sent, embrace so many different breeds, and are so widely scattered over

TABLE I.—*Showing the Number of Rams and Ewes, and the Percentage of Lambs,*

BREED	No. of flocks	RAMS			EWES			LAMBS			
		Lambs	Older	Total	Lambs and one-shear	Older	Total	No. of flocks	No. of ewes	No. of lambs	Per cent. of lambs
Suffolk . .	38	79	82	161	1,608	5,898	7,506	36	7,170	10,165	141·77
Kent . .	15	—	254	254	3,791	6,140	9,931	13	8,481	10,521	124·05
Southdown .	23	34	152	186	2,262	6,872	9,134	22	7,834	8,609	109·89
Hampshire .	53	259	214	473	8,448	17,952	26,400	50	24,860	28,512	114·69
Oxford Down	20	11	72	83	1,156	2,399	3,555	18	3,189	3,800	119·16
Dorset Horn .	31	47	123	170	3,922	6,363	10,285	25	8,163	10,092	123·63
Shropshire .	60	5	191	196	2,662	5,830	8,492	56	8,044	11,004	136·79
Lincoln .	62	2	365	367	5,874	12,006	17,880	54	15,789	17,542	111·1
Various Pure Breeds	36	6	189	195	2,246	7,764	10,010	32	5,840	7,358	126·0
Total Pure Breeds	338	443	1,642	2,085	31,969	71,224	103,193	306	89,370	107,603	120·4
Crossbreds .	59	84	331	415	4,236	15,244	19,480	52	12,165	15,751	129·47
TOTAL	397	527	1,973	2,500	36,205	86,468	122,673	358	101,535	123,354	121·48

Twins, Abortion, and Barrenness of the Total Ewes, of each Breed.

TWINS				ABORTION				BARRENNESS				
No. of flocks	No. of ewes	No. of ewes bearing twins	Per cent. twins	No. of flocks	No. of ewes	No. of aborted ewes	Per cent. aborted	No. of flocks	No. of ewes	No. of barren ewes	Per cent. barren	Total loss, aborted and barren
16	2,853	1,490	52·22	36	6,861	92	1·34	36	7,130	234	3·28	4·62
11	6,703	2,104	31·38	9	3,901	54	1·38	15	9,931	549	5·52	6·9
18	6,583	1,229	18·67	21	8,894	255	2·86	23	9,134	464	5·08	7·94
44	21,141	5,093	24·09	48	23,755	371	1·56	51	25,100	615	2·45	4·01
14	2,601	911	35·02	16	2,688	36	1·34	20	3,555	180	5·06	6·4
27	8,588	3,225	37·55	28	9,020	371	4·11	29	9,408	273	2·9	7·01
36	4,124	1,932	46·84	52	7,426	112	1·5	58	7,882	478	6·06	7·56
46	11,430	3,326	29·09	59	16,697	668	4·0	60	16,570	1,325	8·0	12·0
25	4,513	1,268	28·09	31	6,636	93	1·4	35	7,810	436	5·58	6·98
237	68,536	20,578	30·02	300	85,878	2,052	2·39	327	96,520	4,554	4·71	7·1
38	9,314	2,891	31·04	50	11,361	173	1·52	57	18,060	588	3·25	4·77
275	77,850	23,469	30·14	350	97,239	2,225	2·28	384	114,580	5,142	4·48	6·76

the country, that it has not been considered worth while to accord them the detailed treatment such as is given to the pure-bred flocks; they serve, however, for comparison statistically in the tables given. In the following account, therefore, unless it is otherwise specially stated, my remarks refer only to the pure-bred flocks.

The present paper is, as its title sets forth, merely an abstract of a much more extensive and detailed piece of work. It has not been possible to include here a full account of all the information supplied to me, nor of the many tables of statistics from which the results have been deduced. It is hoped, however, this brief *résumé* will give an accurate picture of the facts, and that, as such, it may prove of interest to the sheep-breeder.

I have considered it advisable to regard the sources from whence I have received the information detailed in the following pages as private, and I would here offer my best thanks to all those gentlemen who have so willingly placed at my disposal their invaluable practical knowledge.

Abortion.

The percentage of abortion experienced by 300 flockmasters varies from 23·75 per cent. to 0 (Table II.), while the percentage for 85,878 ewes is 2·39 per cent. (Table I.). In the latter table it is shown that the Dorset Horn (4·11 per cent.) and Lincoln (4 per cent.) breeds suffer most from losses by abortion, that the Southdowns (2 86 per cent.) occupy an intermediate position, while the other breeds suffer the least, and all to a very similar extent.

In the same way Table II. shows that the Dorset Horn and Lincoln breeds are liable to the highest losses from abortion, the Southdowns are again in an intermediate position, while of the remainder the Kent and Oxford Down breeds are remarkably free from any high returns of losses from this cause.

When the flock percentages are analysed we get the following result: Amongst 300 flocks, 134 are found to have less than 1 per cent. of abortion, 78 flocks have 1 per cent., 39 flocks have 2 per cent., 14 flocks have 3 per cent., 10 flocks have 4 per cent., 4 flocks have 5 per cent., 5 flocks have 6 per cent., 3 flocks have 7 per cent., 2 flocks have 9 per cent., and 11 flocks have 10 per cent. and over. More than two-thirds of the flocks, therefore, have less than 2 per cent. of aborted ewes, while less than one-tenth have over 5 per cent. Of the 11 flocks with 10 per cent. and more of abortion, 6 are Lincolns,

TABLE II.—*Showing the extreme variations in the Size of the Flocks, and in the Percentage of Lambs, Twins, Abortion, and Barrenness in the Flocks of each Breed.*

BREED	No. of flocks	Rams per flock			Ewes per flock			Per cent. lambs		Per cent. twins		Per cent. abortion		Per cent. barren	
		Most	Least	Average	Most	Least	Average	Highest	Lowest	Highest	Lowest	Highest	Lowest	Highest	Lowest
Suffolks	38	9	1	4	502	18	197	180·18	113·53	85·58	24·47	9·81	0	9·09	0
Kents	15	45	1	17	1,700	80	662	140·0	107·0	50·0	17·0	3·33	0	11·05	3·88
Southdowns	23	25	2	8	1,300	35	397	141·31	60·95	37·69	2·4	13·33	0	51·42	0
Hampshires	53	40	1	9	2,259	60	498	150·0	91·71	50·0	7·84	9·83	0	18·33	0
Oxford Downs	20	13	1	4	380	61	178	167·5	93·75	66·5	15·0	3·82	0	13·0	1·08
Dorset Horns	31	19	2	5	670	100	331	180·0	84·96	69·34	21·25	23·75	0	10·68	0
Shropshires	60	16	1	3	742	20	141	192·07	78·66	80·0	47·06	6·66	0	48·0	0
Lincolns	62	25	1	6	1,157	31	288	169·28	59·09	66·66	4·16	22·8	0	47·73	0
Various Pure Breeds	36	42	2	5	2,200	25	280	203·8	86·66	69·52	2·65	7·55	0	17·85	0
Total Pure Breeds	338	45	1	6	2,259	18	305	203·8	59·09	85·58	2·4	23·75	0	51·42	0
Crossbreds	59	100	1	7	6,000	8	330	225·0	86·2	81·57	4·03	5·17	0	12·0	
TOTAL	397	100	1	6·3	6,000	8	309	225·0	59·09	85·58	2·4	23·75	0	51·42	0

3 Dorset Horns, and 2 Southdowns, and most of them are large flocks of between 400 and 1,000 ewes.

With regard to the causes which induce abortion little is known, but I think something may be learned from a consideration of the information submitted to me.

No doubt some ewes are constitutionally unable to carry their young full time. I have no statistics which can be brought to bear on this aspect of the subject, but the proportion of such ewes must be very small. Again some ewes, while fully able to bear young, are liable to have their generative system easily deranged, and it seems highly probable that, in flocks with a small percentage of abortion, the greater number of aborted ewes are of this class.

Where excessive abortion occurs in a flock, other causes must be looked for, and it is in such cases that the least is known.

Fright (from strange dogs, from hounds running through a flock, from felling trees, shooting, or thunder) and over-exertion (from jumping ditches, over-driving, straining in deep mire, crushing through a gateway, or crowding at the troughs) are frequently credited with being the cause of abortion when excessive abortion occurs in a flock. It may be, in some cases, that particular ewes were in a condition which allowed such things to bring on abortion, but it is quite certain that these causes do not truly account for all the excessive abortion which is laid to their charge.

Every shepherd knows of cases where fright and over-exertion such as I have mentioned are not followed by abortion, and in such cases the circumstance is forgotten; but if excessive abortion should occur from any cause, the most usual reason assigned is either fright or over-exertion.

The age of ewes.—My statistics indicate that shearling ewes are, on the whole, more liable to abortion than older ones, especially under adverse circumstances; thus in times of drought, when feed is scanty and short of nourishing qualities, young ewes are more liable to abortion than older ones. Similarly a very hot season or a very cold season is likely to affect young ewes more than the older breeders. Therefore, it is not surprising to find that an excessive proportion of shearling ewes in flocks is associated with a percentage of abortion which is higher than the average.

Among Dorset Horn sheep, which come to maturity quicker than sheep generally do, this is not particularly noticeable, though there are indications of it; but among Lincolns there is strong evidence that the excessive percentage of abortion

they experience is associated with the use of an undue proportion of shearling ewes in the breeding flock.

The district and subsoil.—On the Chalk Downs of Hampshire the Hampshire sheep appear to suffer less from abortion than they do when run on Oolite; East Anglia generally is more favourable to Southdowns than various other districts from which I have had details of this breed; and Lincoln sheep run on the Wolds markedly suffer more from abortion than sheep of the same breed run elsewhere.

I do not maintain that the influence of district and subsoil is an influence that cannot be overcome; but there is reason to know that, for some reason or other, certain districts best suit certain sheep, and the statistics before me indicate that the percentage of abortion is also influenced thereby, though probably only to a slight extent.

Rainfall.—Both the Southdown and the Hampshire Down statistics show that a heavy rainfall during gestation is associated with a high percentage of abortion. This is explained by some to be due to the fact that wet lairs are bad for ewes in lamb on account of chills; by others it is ascribed to the fact that a heavy rainfall produces a rank growth of feed, the effect of which is undoubtedly bad for ewes in lamb. The matter is referred to more fully subsequently.

Among Dorset Horns, which breed much earlier than other kinds of sheep, a light rainfall during the spring leads to shortness of keep on the Downs, and thus, it is believed, influences the percentage of abortion by resulting in poor condition of the breeding ewes.

The food and resulting condition of the ewes, however, are apparently the chief factors which influence abortion. There is a very strong opinion among flockmasters to this effect, and the statistics before me bear out that view in very many cases.

In some districts it is held that particular kinds of food are bad for ewes in lamb, and induce abortion. For instance, there are districts where flockmasters are agreed that turnips are bad and mangels good for pregnant ewes, while in adjoining districts the exact opposite is maintained. Again, some flockmasters will give turnips only sparingly or not at all, whereas others will feed their sheep on little else. I have records of many such cases, but at the same time I have abundant evidence that in all these various districts success is attained, by some flockmasters, by feeding on the very lines which others consider bad.

The result of a careful analysis of the evidence before me leads me to believe that it is not the kind of food so much as the condition of that food, and the method of feeding, which

influence the percentage of abortion, and that it is food which induces poor condition of the ewes, which is indigestible and has poor nourishing qualities, which is bad for them.

In other words, I have strong evidence to show that, in a large proportion of cases, a high percentage of abortion is associated with the poor condition of the ewes. The statistics do not go so far as to show that poor condition of ewes is invariably associated with a high percentage of abortion, but that it is undoubtedly one of the causes which exert great influence, and that during gestation it is of the highest importance to supply the mother with sufficient nutriment. In different districts, of course, and under different conditions, only certain forms of food are available. I have not the space here, I regret to say, to enter into a detailed account of the exceedingly interesting evidence which has reached me from numerous districts; but briefly, it may be said that a sound, ripe, nutritious food is essential, a rank watery growth or unduly forced growth is bad, and that, where the latter has to be given, it must be supplemented with a sufficient proportion of dry food.

The effect of unripe or rank growth is speedily seen, and therefore quickly recognised; but the effect of innutritious food takes longer to show in the ewes, and is not so generally understood. Ewes may be weakened by poor food without showing bad condition for some time, and then when, apparently suddenly, they show weakness, it may be too late to overcome it. The weakness in some cases takes the form of a weak power of assimilation, and is apparently brought about by a continuous supply of innutritious food, so that, even when a better quality of food is given, much of it passes undigested through the body, and abortion may follow from want of sufficient nutrition for the fœtus.

Dorset Horn flockmasters, whose ewes during gestation are dependent on the Downs in summer for the greatest part of their food, specially recognise this danger, and it is a danger which is, I think, too often neglected by flockmasters of other breeds.

"*Sheep-stained*" *land* and crops grown with the aid of sheep manure are credited with producing abortion, and there is certainly strong evidence in favour of this view, where rank or over-stimulated growth results. The subject is a wide one, and is subsequently referred to in a special section of this paper.

Abortion in the Dorset Horn breed.—Of all breeds the Dorset Horns appear to be most liable to abortion, and were it not for the practice of leaving rams with the breeding ewes until lambing time, and to the capacity of those ewes to breed at almost any time throughout the year, there is no doubt that their abortion percentage would be much higher than is indicated in

Table I. As a matter of fact, in many cases, ewes are counted fertile which bear young two or three months late; in other breeds these would be barren or aborted ewes.

In some cases the ewes have become pregnant to particular rams, and afterwards all slipped their lambs, whereupon, on putting fresh rams to them immediately, they have all become pregnant again, and borne healthy lambs. This is not an isolated instance; I have information from several independent sources of the same occurrence. The rams are generally credited with being at fault in such cases, and yet they have got the ewes in lamb, and it is difficult to see how they have failed. I am more inclined to think the failure is due to the constitution of the ewe. As will be seen later, in the sections referring to barrenness and fertility, Dorset Horn ewes, on the whole, are undoubtedly more prolific with Down rams than with rams of their own breed; and, further, a considerable proportion of those which fail to become pregnant to a Dorset Horn ram will readily bear young to a Down ram.

These facts indicate a weakness or instability of the generative system, and a need for a special stimulus, which appears to be pronounced in the ewes of this breed; and I am disposed to think it is not improbable that their liability to slip lambs got by one ram and to bear lambs got by another, is due to the same cause. It is an interesting question for determination.

I do know of inbred Dorset Horn flocks which are very prolific, and am disposed to think their fertility is largely assisted or stimulated by special feeding. No doubt it may do much, but special feeding is expensive and out of the reach of most, except perhaps a few ram-breeders, and I have good reason for the belief that what I have written above holds good for the majority of those Dorset Horn flockmasters who have sent me returns.

Abortion in the Lincoln breed, as has already been noted, occurs chiefly on the Wolds, and is associated with poor condition of the ewes, and with more than the average of shearling ewes in the flocks.

Sometimes the loss from abortion reaches 30, 40, and even 50 per cent., and there are many flockmasters in the Wolds who have experienced this. In such cases it generally occurs from a month to ten days before lambing time, and very usually in large flocks.

Sometimes a single flock suffers in this way, but at other times several neighbouring flocks are affected; it then appears to be transmitted from one flock to another, and to attain an epidemic form.

The ewes themselves do not appear to suffer; they feed well, and readily fatten after abortion. There is no indication of peritonitis; the generative organs alone appear to be affected.

I am assured by well-known flockmasters, who thoroughly understand their business, that they can give no reason for the occurrence of this excessive abortion; it occurs in flocks which a few days before appeared to be in exceptional health and condition, in flocks fed on healthy sound food, at times when there was no severe weather and when there was no reason, so far as they knew, for failure. The attack in these cases is a sudden one; without notice, and while under careful observation, 30 per cent. of the ewes in a flock will fail, and a few days later will abort dead lambs.

I know of no other district where abortion in ewes takes this same form, and there is, in my opinion, urgent need for inquiry into the subject.

Some years ago, Professor J. Wortley Axe made a report[1] on an "Outbreak of Abortion and Premature Birth in the Ewe Flocks of Lincolnshire during the Winter and Spring of 1882–1883," in which it was estimated that 12 per cent. of ewes aborted during this outbreak, and that the cause of the disorder was operative throughout the entire county, on the high wolds and low fenlands, on light and heavy soils alike, that the greatest amount of abortion occurred a few weeks before lambing time, and that in a marked excess of cases it influenced the younger portion of the flocks.

Professor Axe remarks there is good reason to think debility was a cause of much of this abortion, and that unripe watery roots of inferior nutritive value, the result of forced growth, had a great deal to do with it. He further condemns the practice of allowing ewes in lamb to follow hogs close-folded on turnips, where the diet of the ewes consists of filth-laden shells in an impassable slough; and he concludes the outbreak was to be referred to several concurrent hurtful influences:—

(1) The feeding of pregnant ewes exclusively on unripe watery roots and unwholesome filth-laden shells;
(2) Pain and suffering caused by protracted "foot-rot";
(3) Exposure to cold winds and heavy continuous rains;
(4) Fatigue arising from the deep and sticky state of the ground.

I think all flockmasters with whom I have come in contact in Lincolnshire will agree with Professor Axe that the reasons he gives are eminently qualified to induce abortion, though

[1] Journal R.A.S.E., 2nd Series, Vol. XXI., 1885, p. 199.

some might think that he is perhaps inclined to exaggerate the importance of exposure to cold and wet.

His results are certainly in agreement with the information before me, in so far as abortion is associated with poor condition and want of nutrition of the ewes, with unripe food and forced growth of food, and with the younger ewes of the flock. But with regard to the excessive abortion which I have mentioned above, it was certainly not associated, in the flocks about which I have information, with either of the four hurtful influences to which Professor Axe assigns most of the abortion in the outbreak of 1882–83. The weather was not unduly cold or wet; there was no marked foot-rot; the food was sound; the ewes were not fed after hogs, and in one case they were fed on roots carted out on grass. These are therefore not the sole reasons for excessive abortion, there are other causes at work as yet unknown or unrecognised.

One circumstance which I am of opinion may have some influence on abortion on the Wolds, is the practice of unduly crowding ewes on turnips. Owing to the fact that exceptionally fine crops of turnips are grown in that district, they feed more sheep per acre than is usually the case; and in spite of the fact that it is recognised that sheep do better when not crowded too much, they certainly are crowded on Wold farms, with the results, firstly, that the roots are fouled both with mud and excrement, and secondly, that the transmission of an unhealthy condition from one ewe to another is greatly facilitated. Another point is that, owing to the fact that the size of the flock is regulated largely by the supply of turnips, and to the fact that while turnips are plentiful pasture is comparatively scarce on the Wolds, the ewes are likely to be kept somewhat poor before they are turned on to turnips. If they should be kept too poor during the early stages of gestation, it is not improbable that they may be unable to pick up again, and, as I have already pointed out, such a circumstance may easily escape notice until too late.

Excessive abortion in this district is not confined to pure-bred Lincolns; cross-bred ewes also appear to be susceptible.

BARRENNESS.

The percentage of barrenness experienced by 327 flock-masters varies from 51·42 per cent. to 0 (Table II.), while the percentage of 96,520 ewes is 4·71 per cent. (Table I.). About twice as much barrenness as abortion is recorded on an average, and only three breeds have less than 5 per cent., namely, Hamp-

shire Downs, Dorset Horns, and Suffolks, while Lincolns have 8 per cent., and Shropshires 6·06 per cent. Table II. shows that the highest percentage of barrenness, between 51 and 47 per cent., is experienced in Southdowns, Shropshires, and Lincolns, while in the other breeds it varies between 9 and 18 per cent. With the exception of the Dorset Horns, which have only 2·9 per cent. of barrenness amongst their ewes, all other breeds experience a higher, and generally a considerably higher, percentage of barrenness than of abortion.

From these circumstances it is not surprising to find a much greater variation among the flock percentages; thus among 327 flocks 59 have less than 1 per cent., 61 have 1 per cent., 39 have 2 per cent., 33 have 3 per cent., 20 have 4 per cent., 37 have 5 per cent., 16 have 6 per cent., 13 have 7 per cent., 12 have 8 per cent., 6 have 9 per cent., while 31 have 10 per cent. and over.

Thus only two-thirds of the flocks have under 5 per cent., while nearly one-tenth have 10 per cent. and over.

When these returns are compared with the returns for abortion (p. 222) the increased liability to barrenness is markedly demonstrated. It may be added that the occurrence of excessive barrenness occurs rather in flocks of under 400 ewes than in larger flocks.

With regard to the causes which influence the percentage of barrenness, it is very generally conceded that 2 per cent. is a liberal allowance for constitutionally barren ewes, and that anything over 2 per cent. experienced is due to other causes.

The age of ewes.—The opinion has been not infrequently expressed to me that shearling ewes are more liable to barrenness than older ewes. I have, however, no evidence of that in the returns submitted to me for any breed, except perhaps for the Dorset Horns. For this breed there is some evidence that in unfavourable tupping seasons, during great heat and scarcity of green food, the young ewes are more likely to be affected than the older ewes, and less likely to be in a satisfactory breeding condition. The early tupping season renders them liable to such conditions; but this is peculiar to Dorset Horns, and I have no similar evidence for other breeds.

The age of rams.—Returns of Southdown, Hampshire Down, and Dorset Horn flocks show that the sole use of ram lambs is attended with a higher average percentage of barrenness than when older rams are also used. This is probably due to the fact that whereas older rams are frequently, if not generally, rams of known fertility, ram lambs are untried and subject to failure which may escape detection until too late; while it may further

be asserted that young rams must necessarily be liable to more chances of failure, and require more careful watching, than older tried rams.

The use of ram lambs, with reference to barrenness and the fall of lambs, is referred to in a subsequent section.

The proportion of ewes per ram.—This varies from 40·7 ewes to 1 ram in the Kent flocks on an average, to 60 to 1 in the Dorset Horn flocks on an average.

In the Southdown flocks there is an average of 49 ewes to each ram, and in those flocks with a high percentage of barrenness there is some indication that the rams were overworked; thus in one of these flocks there were 70 ewes to each ram (shearlings), in another there were 63 ewes per ram, and in a third 59 ewes per ram, and half of the latter were ram lambs. It is, however, only in the Lincoln flocks, in which there are on an average 48·72 ewes per ram, that there is consistent evidence of the fact that the percentage of barrenness experienced is associated with the proportion of ewes per ram; thus, in 29 flocks, with less than 5 per cent. of barrenness, the proportion is 44·93 ewes to 1 ram; while in 31 flocks, with more than 5 per cent. of barrenness, the proportion is 51·1 ewes per ram; and in 4 flocks, with over 20 per cent. of barrenness, the proportion is 53·1 ewes per ram.

The very great powers of reproduction possessed by the ram are apt to make one inclined to lay but little stress on the proportion of ewes per ram; but if many ewes go over once or twice, or if a ram fails and his ewes are added to those already apportioned to other two or three rams, the work is made heavy for the latter, particularly if the original proportions were 50 or 60 to 1.

Dorset Horn flockmasters frequently keep a Down ram to serve ewes which do not prove in lamb to the Dorset Horn ram they are mated with; in some instances these Down rams have not been included in the numbers given, so that the proportion of 60 ewes per ram, while it represents the breeding stock of Dorset Horns possessed, does not accurately represent the proportion of ewes got in lamb by each ram.

A change of ram is frequently found to be of service, for the reason that one ram may be more successful than another with certain ewes. These ewes are apparently more susceptible to fruitfulness with one ram than with another, and may even, in some cases, be said to exhibit a preference for a particular ram.

The district and subsoil appear to have some influence on the percentage of barrenness in one or two breeds; as for

instance in the Shropshires, those flocks run on New Red Sandstone are conspicuous for the high percentage of barrenness they return, and they are flocks which are not run in the home county. Again, amongst Oxford Downs, it is the outlying flocks run on Oolite and Lias that suffer most; amongst Suffolks, it is a few flocks run on clay or crag in Essex; and amongst Lincolns, it is the flocks on the Wolds that are associated with a high percentage of barrenness; whilst among Hampshire Downs the flocks run on the Chalk Downs undoubtedly give the best returns.

The rainfall, if excessive, is considered liable to induce barrenness, on account of wet lairs.

The food and resulting condition of rams and ewes at tupping time have without doubt an influence on the percentage of barrenness. There is no evidence that any particular kind of food produces barrenness; in some instances it certainly appears that the flushing of ewes is attended with good results, but on the other hand that is a practice which most flockmasters regard with disfavour. Fresh pasture for ewes before tupping is recognised, by those who can command such, as the best possible food; they urge it is the most natural and the best for breeding purposes.

The records regarding the most favourable "condition" for ewes at tupping time vary for different breeds in different districts. Thus the Suffolk and Shropshire flocks are highly fed as a rule, and in those breeds a high percentage of barrenness is associated with flocks which are *very* highly fed; on the other hand, Dorset Horns, Lincolns, and Kents are certainly not highly fed as a rule at tupping time, and the highest percentage of barrenness occurs, in these breeds, among the poorest-kept flocks.

As a rule, I think it may be fairly claimed that somewhat spare ewes in an "improving condition" are the most fit for breeding, but in those seasons when, and in those districts where, the supply of food and the quality of food can be regulated to a nicety, advantage is gained by having the breeding ewes in "good condition"; poor ewes in improving condition are, however, undoubtedly better fitted for breeding than are ewes in good condition which are going back.

Flockmasters, as a rule, most strongly urge that fat permanently damages the constitution of a breeding ram, and I have many letters from flockmasters, in which the opinion is strongly expressed that an alteration of show rules which would prevent rams being shown fat would be of the greatest benefit to breeders. Some claim that if they have sufficient time they

can reduce a fat ram to good breeding condition; but almost all of them agree that while rams cannot be in too good condition before the breeding season, they certainly should not be fat.

My statistics show that rams in good condition at tupping time undoubtedly do the best, but that fat rams are frequently associated with high barrenness returns.

Fat ewes are rarely met with at tupping time, and still more rarely associated with success, while fat rams are more successful with poor ewes than with fat ewes.

The usual percentage of barrenness experienced by flockmasters, as returned by them, demonstrates that the results arrived at by the statistics for 1896–97 are not abnormal. Of course under this heading excessive losses are not included, and some allowance must be made for them; apart from that, however, there is a fairly close agreement between the usual percentage of barrenness and the barrenness returned for 1896–97 in the case of each breed.

The largest percentage of barrenness ever experienced by flockmasters, as returned by them, shows that, in all breeds, severe loss from barrenness is not so unusual an occurrence as some breeders would have us believe. The returns vary from 100 per cent. downwards, and heavy loss is usually assigned to the failure of the ram, the poor condition of the ewes, or to poor land. The breeds which, according to this return, are the most susceptible to large losses from barrenness are the Southdowns and the Lincolns, while the Dorset Horns show the least susceptibility to losses of this nature. It is interesting to note that this result is in close agreement with the conclusions arrived at for the year 1896–97 (see p. 230).

The total loss from abortion and barrenness is not under 4 per cent. for any breed; it is generally over 6 per cent., reaches as high as 12 per cent. for the Lincoln breed, and is, on the average, for all breeds 7·1 per cent. (Table I.).

There can be no doubt the Suffolk and Hampshire Down breeds are specially free from losses of this nature, while the Lincolns are specially subject to them, taking the returns as a whole. An analysis of the Lincoln flocks, however, shows that it is the flocks on the Wolds which are chiefly responsible for the heavy percentage shown in Table I., since 16 flocks run in that district, consisting of 6,843 ewes, show a loss of 17·78 per cent. from these combined causes. Such figures as these must show that the need for attention to this matter, on the part of flockmasters in the Wolds, is most urgent.

FERTILITY.

The proportion of lambs recorded by 306 flockmasters varies from 203·8 per cent. to 59·09 per cent. (Table II.), while the proportion for 107,603 ewes is 120·4 per cent. (Table I.).

When the flock percentages of lambs are analysed, it is found that the most usual proportion of lambs for all pure-bred flocks is between 110 and 120 per cent., that somewhat more than 50 per cent. of the flocks have less than 130 per cent. of lambs, and that, as a rule, the highest percentage of lambs is experienced in small flocks. As illustration of the latter remark, I may add, my statistics show that, out of 85 flocks of 100 ewes, 50 of them have over 130 per cent. of lambs; out of 40 flocks of 300 ewes 8 have over 130 per cent. of lambs; whereas out of 11 flocks of more than 1,000 ewes, only one flock has more than 130 per cent. of lambs.

The percentage of twins recorded by 237 flockmasters varies from 85·58 per cent. to 2·4 per cent. (Table II.), while the percentage for 68,536 ewes is 30·02 per cent. (Table I.). As was mentioned in the Introduction, the percentage of twins is a check on the accuracy of the percentage of lambs, and an analysis of the figures quoted above, regarding both lambs and twins, shows that, on the whole, the fertility of ewes is very fairly represented in the table.

Thus, roughly analysing the totals obtained for all pure-bred flocks (Table I.), if 30 ewes produce twins, that is 60 lambs, out of a total of 120 lambs, the remaining 60 lambs will require another 60 ewes for their production; 90 ewes, then, will produce 120 lambs, and as 7 per cent. of the ewes are either barren or abort their young, and 3 per cent. of the ewes on an average die (see remarks in Introduction, p. 219), the whole 100 ewes which are necessary for the production of 120 lambs are accounted for.

The returns for each breed do not work out quite so accurately. There is a discrepancy which can only be accounted for by mortality among the lambs or among the ewes; but the error is, as a rule, not more than 3 per cent. one way or the other—not a large error when the difficulties of enumeration and the chances of exceptional mortality are taken into consideration.

In the following account, unless otherwise stated, the fertility of a breed is considered in relation to the percentage of twins produced by its ewes.

The difference in the fertility of ewes of various breeds is very remarkable; both the percentage of lambs and the per-

centage of twins show very marked variation in different breeds, and indicate clearly that fertility is a racial characteristic in sheep, probably a much more definite character than is usually recognised.

According to the records of twins in Table I., the breeds may be divided into those of first-class fertility, consisting of the Suffolks and Shropshires; of second-class fertility, Dorset Horns, Oxford Downs, Kents, and Lincolns; and of third-class fertility, Hampshire Downs and Southdowns.

The most fertile of all breeds is the Suffolk, with 52·22 per cent. of twins; and this is a low estimate of the capacity of these ewes, for if the flocks which are run in the home county are taken alone, they show 60·46 per cent. of twins. It is a very remarkable return, and is only beaten among pure-bred sheep by six small flocks of Wensleydales, which record 61·21 per cent. of twins (they are included among the "various pure breeds"). The Shropshires come next with 46·84 per cent., and here again the estimate is low, for nine flocks in Staffordshire record 54·97 per cent. of twins.

Then the Dorset Horns, with 37·55 per cent., the Oxford Downs, with 35·02 per cent., and the Kents, with 31·38 per cent., all show fairly consistent returns; the Lincolns, with 29·09 per cent., are recorded low, if we may trust the returns of nine flocks in Yorkshire which record 47·57 per cent. of twins; while the Hampshire Downs, with 24·09 per cent., and the Southdowns, with 18·67 per cent., are representative returns.

The return for Southdowns calls for special notice; it is so low as to be worthy of the serious attention of flockmasters of that breed. It is not low on account of losses by abortion and barrenness; the figures represent the *fertility* of the breed in comparison with the fertility of other breeds, and if my records are representative, which I see no reason to doubt, special care in the selection of breeding ewes, from the point of view of fertility, seems imperative.

The returns for cross-bred flocks show that several pure breeds are more fertile than the average cross-bred ewe. In this connection it is interesting to observe that the highly fertile Suffolk and Wensleydale ewes, when crossed, are slightly less prolific than when bred with rams of their own breed; while on the other hand the fertility of Dorset Horn ewes, when crossed with Down rams, is greatly increased.

In the case of this latter breed, as I have already noted, the aid of Down rams is very usually called for by Dorset Horn flockmasters, for ewes which fail to get in lamb with Dorset Horn rams; and it is found that, whereas a considerable number

of Dorset Horn ewes may fail to become pregnant to rams of their own breed, they rarely fail when covered by Down rams. Further, I have evidence, from several sources, that Dorset Horn ewes which slip lambs got by Dorset Horn rams, will bear lambs got by Down rams.

It would appear from the above facts that Suffolk and Wensleydale ewes reach the maximum of their fertility with rams of their own breed, while Dorset Horn ewes require a cross in order that they may be stimulated to the greatest generative activity.

With regard to the causes which influence the fertility of a flock, they may be divided into two classes: first, the causes which prevent ewes breeding at all, and secondly, the causes which induce ewes to produce more than one lamb.

The causes which prevent ewes breeding are abortion, barrenness, and death. With regard to the last, my information is very meagre, but there is some reason to think, from records I have received from flockmasters of various breeds, that 3 per cent. is not an excessive amount of mortality, on an average, for all breeds. Of the variation in the mortality of ewes in the different breeds I have not sufficiently accurate means of judging.

Abortion and barrenness have been already treated of, and any causes which influence the amount of abortion and barrenness also influence the fertility of a flock.

The causes which induce ewes to produce twins.—The primary cause is probably constitutional; the racial character of the fertility of different breeds indicates that. Further, there is some reason to believe that twin lambs produce more twins than single lambs, and that the influence of heredity is brought to bear. In that case, where the fertility of a flock is below the average for the breed, careful selection of breeding ewes will probably increase its fertility.

But, besides the constitutional cause, there are other causes which affect the production of twins, and their effect is shown in my statistics by the variation in the proportion of twins in different flocks of each separate breed.

The condition of ewes.—There is overwhelming evidence that flocks in good condition at tupping time have a higher subsequent percentage of fertility than flocks in poor condition at tupping time. The returns for the Suffolk, Kent, Hampshire Down, Dorset Horn, and Lincoln breeds show this clearly.

By "good condition" is meant not "fat," but strong, healthy, vigorous breeding condition.

In confirmation of this view are the records of the time in the lambing season during which most twins are born.

Altogether 275 flockmasters have expressed their opinion on this point: of these, 26 say most twins are born in the middle of the lambing season; 36 say late; 61 say all through the season; and 152 (more than half) say early in the season, and of these latter many add that unless such is the case the crop of lambs is small.

Some flockmasters and many shepherds maintain that the production of twins is due to the ram. It cannot be a question of the amount of spermatozoa evacuated by the ram during copulation: where there is sufficient to fertilise one ovum there is sufficient for a hundred; and unless it can be proved that the production of ova from the ovary of a ewe is influenced by copulation (and it is quite certain that this is not so in the case of horses and cattle),[1] it follows that the production of twins instead of a single lamb is a matter with which the ewe alone is concerned, and that it is not influenced by the ram.

That being so, if most twins are born early at lambing time, they are produced from the ewes which first come in season, and I maintain that, apart from artificial stimulus, such as "flushing," these are the ewes which are the keenest breeders, whose generative system is in the most vigorous and healthy breeding condition, and that it is to their breeding vigour the production of twins is due.

Further evidence of this is afforded by the fact, of which several flockmasters assure me, that ewes which go over or abort —that is to say, ewes whose breeding vigour is impaired—very seldom produce twins to a second service.

There is still another point connected with this question which it may be profitable to note, and that is: in the two breeds with the lowest percentages of twins, namely, the Southdowns and Hampshire Downs, there is the greatest diversity of opinion among flockmasters regarding the time of birth of their twins; and that among the former, whose ewes are the least prolific of all breeds, most of them record "late" as the time when the twins are usually born.

It may be argued from this either that Southdown ewes mature late, or that those Southdown flockmasters who have favoured me with returns suffer from their anxiety to produce early lambs; but however that may be, flocks in which twins are produced late are not highly fertile flocks.

The feeding of ewes.—Different methods of feeding may accelerate or retard the time of season for ewes: it seems quite possible that a ewe may be a vigorous breeder in spite of the

[1] Heape, "The Artificial Insemination of Mares" (*The Veterinarian*, vol. 71, 1898).

fact that she has been kept back; at the same time there is evidence before me to show that ewes which are slow to come in season do not produce many twins.

Forcing ewes for early lambing does not appear to be attended with high returns of fertility as a rule. At the same time, the greatest fall of twins seems to be induced by assisting, rather than by checking, the breeding instinct; and while I do not gather that the "flushing" of ewes is a wise proceeding, it is undoubtedly well to have them in strong improving condition when the rams are put to them, in order to ensure a good fall of twins.

The age of the ewes may doubtless affect the fertility of a flock. In some breeds, notably the Dorset Horns, young ewes bear fewer twins than older ewes; this is apart from the fact that young ewes are more uncertain breeders than two- or three-shear ewes.

The age of the rams.—Where ram lambs are used the opinion is very generally held that they get the largest proportion of twins. I have already shown that the ram is not responsible for twins, and my statistics show that, in breeds where ram lambs are used, a full share of twins are got from ewes which are not served by ram lambs.

Districts.—It is extremely difficult to consider the question of locality apart from the very many other influences, such as management, food, and weather, which act at the same time; but there is some evidence that the district may affect the fertility of a breed, and possibly more than is generally recognised. I do not find, however, that locality influences the racial character of the fertility of a breed, as demonstrated by the return of twins in Table I., with the possible exception of one breed, the Lincolns.

In the following account care has been taken not to base conclusions on single flocks, or on two or three flocks, in which an excess of abortion or barrenness or in which unusual fertility would have undue prominence; for that reason certain isolated flocks have not been available for the subsequent calculations, and it is satisfactory to find that their omission leads to such very slight modification of the percentages arrived at in Table I. for the total flocks of each breed.

The returns sent to me indicate that, as a rule, the districts inhabited by the flocks of the different pure breeds are fairly defined.

The Suffolk flocks are all in East Anglia—Suffolk and Essex chiefly. Of these two counties Suffolk seems to suit the breed best, as the flocks there record an average of 60·46 per cent. of twins, while those in Essex have only 42·87 per cent. In the

latter county, however, in several flocks with a high percentage of lambs, the percentage of twins has not been recorded, and this will account for a good deal of the difference between the two.

The Kent flocks are all in Kent.

The Southdowns are mostly in the South—Hampshire, Sussex, and Surrey—and in East Anglia. Those in the latter district give slightly the better results—22·6 per cent. as against 19·71 per cent. in the South—a result which is probably due to the smaller flocks and to the method of management adopted in East Anglia.

The Hampshire Downs are mostly in Hampshire and in the West country—Dorset, Wilts, and Somerset; those flocks in the home county giving 27·85 per cent., while those in the West country give 22·4 per cent. of twins.

The Oxford Downs are too much scattered, and the number of flocks in the various districts is too small, to allow of fair comparison.

The Dorset Horns are mostly in Dorset and Somerset, and the twins recorded are 38·49 per cent. for the home county, and 36·06 per cent. for Somerset.

The Shropshires are a good deal scattered in the neighbourhood of the home county; but three groups present themselves: the Shropshire flocks recording 40·8 per cent. of twins, the Hereford flocks with 33·09 per cent., and the Stafford flocks with 54·97 per cent. How far the high rate of fertility of the last-named flocks is accidental or due to good management or more suitable food, I cannot say; but there are nine flocks in this group, and it would seem as if the district probably had something to do with the result.

The Lincolns give the most startling results, the flocks in the home county recording 25·11 per cent. of twins, those in Yorkshire 47·57 per cent., and those in other neighbouring counties 33·78 per cent. The flocks in Yorkshire are thus nearly twice as fertile as those in Lincolnshire. The Lincoln flocks on the Wolds record 23·75 per cent. of twins and 17·78 per cent. of loss from abortion and barrenness; those in other parts of Lincolnshire record 24·13 per cent. of twins and 7·79 per cent. of loss. The rate of fertility in these two districts is therefore practically the same, and it cannot be urged that it is greatly reduced by excessive loss from abortion and barrenness in the lowlands of the home county.

The Yorkshire flocks, with their 47·57 per cent. of twins, have 4·78 per cent. of loss, and, when compared with those Lincolnshire flocks which are *not* run on the Wolds, their

supremacy is very remarkable. The Yorkshire flocks, of which there are nine, are smaller than the average flocks in Lincolnshire, and they are obviously very carefully attended to; but one can hardly believe that management will account for an average difference of double the rate of fertility. One is driven to the conclusion that locality is here exerting an influence, and that Lincoln ewes might, in different circumstances, rank in the first class instead of at the bottom of the second class as regards fertility. This is a very important fact for Lincolnshire flockmasters to recognise.

With regard to the percentage of lambs recorded, the Suffolks are again at the head of the list, the Shropshires again second; they are followed by the Kents, Dorset Horns, and Oxford Downs, while the Lincolns are now classed with the Hampshire Downs and Southdowns.

Of the three latter breeds the Hampshire Downs and Southdowns show a record of lambs which is in keeping with their percentage of twins, but the low percentage of the Lincolns cannot be so accounted for, and is due to the heavy loss from abortion and barrenness, which so greatly reduces the number of effective breeding ewes.

This is especially noticeable in the flocks run on the Wolds. In these flocks, of which there are sixteen, as has been already noted, there are 23·75 per cent. of twins, 17·78 per cent. of loss, and 101·33 per cent. of lambs. The ewes show fertility but slightly short of the average for all pure breeds, and yet flockmasters in that district appear to be content if they have anything over a lamb per ewe on June 1. In substantiation of this statement I may quote the experience of a large flockmaster on the Wolds, who put 8,000 ewes to the tups in the last ten years, and averaged on May day of each year 102·15 per cent. of lambs, while the ewes which died or aborted or were barren amounted to 14·36 per cent. per annum.

These figures suggest that, besides the loss of breeding ewes, there is from time to time considerable mortality among the lambs, a suggestion which I have good reason to believe has ample foundation in fact.

In view of what is possible with Lincoln sheep in Yorkshire, which return 127·26 per cent. of lambs, it would appear that flockmasters on the Wolds would do well to look more closely into this matter, and I would suggest that a detailed inquiry as to the causes which induce the loss from abortion and barrenness, and the mortality among the lambs, would probably lead to beneficial results.

The Use of Ram Lambs.

Various opinions are held regarding the advantage, or otherwise, attending the use of ram lambs for breeding purposes. Apart from the view, elsewhere disposed of, that the percentage of twins born is influenced by the use of ram lambs, it is of interest to compare the percentages of lambs got, and of barren ewes, in relation to the age of the ram.

According to my returns ram lambs are rarely used except in the following breeds: in the Suffolks 49 per cent. of the rams used are ram lambs; in the Hampshire Downs 55 per cent. are ram lambs; in the Dorset Horns 28 per cent. are ram lambs; while in the Southdowns 18 per cent., and in the Oxford Downs 13 per cent., are ram lambs.

The number of flocks available for analysis in these two last-named breeds is too small for fair comparison, but in the three other breeds I have divided the flocks into—

A. Those in which all the rams used are ram lambs;
B. Those in which 50 per cent. or more are ram lambs;
C. Those in which less than 50 per cent. are ram lambs, and
D. Those in which no ram lambs are used at all.

The result of my calculations for the Suffolk breed, in which thirty-six flocks, consisting of 7,170 ewes, are concerned, shows that the best results are obtained by thirteen B flocks, the worst results by seven A flocks, while eight C flocks give slightly better returns than eight D flocks; and it would appear from these statistics that the use of ram lambs to a limited extent gives better results than when no ram lambs are used, but that it is advisable to use no ram lambs rather than to rely wholly upon them for breeding purposes. The order therefore is B C D A.

In the Hampshire Down breed fifty flocks, consisting of 24,860 ewes, are made use of in the analysis, and the result obtained is, that seven C flocks show the best results, and five D flocks the worst; and this latter is true in spite of the fact that eight A flocks have double as many barren ewes as the D flocks. Here again a moderate use of ram lambs is attended with good results (there are thirty B flocks in this breed giving better results than the D flocks), the order being C A B D.

In the Dorset Horn breed, in which twenty-nine flocks, consisting of 9,020 ewes, are concerned, in spite of the reduced proportion of ram lambs used on the whole for breeding purposes, six C flocks again give the best results, and a moderate proportion of ram lambs is again shown to be of advantage.

(There are 9 B flocks, 13 D flocks, and only 1 A flock in this breed.)

Here the order is, omitting the one A flock, C D B.

With regard to barren ewes, the A and B flocks have invariably the highest percentage in all three breeds, the uncertainty of ram lambs as breeders being thus indicated.

From these results it would appear that if ram lambs are not actually responsible for twins they are still associated with their production, and it might be argued that the latter statement is directly opposed to the former; but that is not so, and when it is remembered that ram lambs are very generally put to the ewes first, and the older rams not until afterwards, it is seen that ram lambs may be associated with twin-getting because they serve the ewes which first come in season, and these, as I have elsewhere shown, are the ewes which produce the most twins.

But my statistics are open to question, for the Secretary of the Suffolk Sheep Society has collected data on this point for several years, and has kindly supplied me with the results, and they differ from mine.

By these results it is shown that during the years 1887 to 1892, in 218 flocks, consisting of 58,416 ewes, 18 D flocks gave the best results, both as regards lambs and barren ewes, while 40 A flocks were the next best, the difference between them being 3·24 per cent. lambs and 0·81 per cent. barren ewes (there were 120 B and 40 C flocks), the order being D A B C.

Again, during the years 1893–96, in 204 flocks, consisting of 49,976 ewes, 34 D flocks and 54 C flocks were practically equal, the former only returning ·06 per cent. more lambs and ·34 per cent. less barren ewes than the latter (there were 24 A and 92 B flocks), the order being D C A B, the last two being equal.

It is true that these statistics are compiled from many more flocks of Suffolk ewes than I had information about, but it is to be noted that in the returns for 1887–92 there were only 18 D flocks out of a total of 218, and that these were much smaller flocks than the average B and C flocks; while in 1893–96 there were 34 D flocks out of a total of 204, and they were of even smaller average size. Yet, in the latter years, the D flocks had not maintained their supremacy to the same extent.

In 1897, however, the statistics of the Suffolk Sheep Society deal with 37 flocks and 8,961 ewes; and again 4 D flocks have the advantage, showing 1·83 per cent. more lambs and 1·44 per cent. less barren ewes than 20 B flocks, which take the second place (there were 3 A and 10 C flocks), the order being D B C A.

But here again only 4 flocks are included as D flocks, and

they average less than 100 ewes each, while there are 20 B flocks of an average of 279 ewes per flock.

We have seen already that small flocks are uniformly more fertile than large flocks, and when this fact is remembered, and when it is recollected that a larger proportion of D flocks, in the Suffolk Sheep Society returns, reduces their supremacy, I am not disposed to believe that the uniform result arrived at by my statistics for three separate breeds, namely, that the use of a limited number of ram lambs is associated with good results as regards fertility, is greatly in error.

"Sheep-stained" Land

The "staining" of land by stock, and the advantage of fresh land, what one of my correspondents calls "virgin soil," for all breeding stock and for their young, is more or less recognised in a general way in this country. Here and there, however, breeders are found who have paid particular attention to this point, and who have given expression to strong opinions thereon. If there is truth in the fact, it merits more consideration than is usually paid to it. I have not got data to enable me to treat the subject from a statistical point of view, but I append some notes, collected in the course of this inquiry upon sheep, which I think deserve mention.

First, with regard to the evidence concerning the fact. From certain Suffolk flockmasters comes the opinion that roots grown on sheep-manured land are bad for ewes in lamb, and must be given with great care. Roots which have been unduly forced by any manure are recognised as dangerous food for pregnant ewes, but those forced by sheep manure, it is held, are specially qualified to cause abortion. This opinion, it is claimed, is derived from long experience and careful attention to the subject.

It is a common practice in parts of East Anglia to fold sheep on trifolium, and then to grow turnips on that land as feed for breeding ewes; in such cases it is always advisable to cart away, for cattle, the roots grown near the gate of the field, because, it is argued, the habit of sheep to congregate near a gateway leads to excessive manuring of that part and to a dangerous growth of the subsequent crop. The practice is very usual, although the reason for it is not perhaps so generally recognised.

In Dorsetshire, correspondents assure me, it is well recognised that it is dangerous to feed pregnant ewes on crops grown on land which has been "close folded," whereas on land which has been "folded back," that is, where a fresh piece is added to

the fold each day or two and the sheep allowed a continuously increasing area of run, the danger is much diminished. I judge this difference to be due to the fact that close folding leads to heavier manuring, and much greater fouling of the land, than occurs when the sheep have more room, since in close folding the manure is trodden deeper into the ground.

From Lincolnshire and from other parts of the country come similar statements, and some flockmasters go so far as to urge that straw off land which has been folded by sheep for the corn crop should be avoided as food for sheep, and that hay should be given to sheep which comes off fresh land, and not off land which has been manured by sheep.

With regard to pasture, it is very generally recognised that sheep require a change; that after a time sheep pasture becomes foul—"sour" it is often called—and neither breeding ewes nor lambs thrive on it. From East Anglia, the West country, the Midlands, Scotland, and Australia I have received opinions from breeders on this point, and I do not believe there is any room for doubt that pasture is "stained" by sheep more or less rapidly, and that a change becomes necessary, particularly for breeding ewes and lambs.

Flockmasters in some districts do not appear to be so familiar with the idea that sheep "stain" the land, as are those in other districts. This may be due to the different methods of farming, as for instance in those districts where the four-field system is adopted. There sheep are only on any one piece of cultivated land every two years, and while some flockmasters recognise the advantage gained by this method, others appear ignorant of the danger thus avoided. Then weak land appears to "stain" more easily than strong land, and hence crops grown on weak land which is manured by sheep are more likely to be dangerous than crops grown on strong land similarly manured. I have information on this point from a flockmaster who has paid close attention to this subject, and who farms both kinds of land, and from his remarks it seems obvious that those whose farms are wholly on strong land will be apt to underrate the importance of the subject.

From horse-breeders I have similar information. A large breeder in the West country never allows his breeding mares to feed for more than, say, two consecutive years in one paddock; and I understand from him that he recognises the result of doing so is to reduce the vigour of the offspring. Again, the general custom in the fen country, twenty-five years ago, was to pasture mares on seeds. It is not so usual now on account of the lower price of cereals and consequent increase of permanent grass land;

but still, as far as possible, the old system is carried out by some breeders who, in the words of one of them, find "no other kind of keeping equal to it, especially for mares breeding," and "no other pasture to compare with it for making bone and substance in young horses." It is to this habit of providing mares and foals with fresh feed, grown on land which is ploughed each year, that some competitors from other districts attribute the great power and size of fen-bred horses.[1]

Similar opinions are held by cattle-breeders, while the necessity for change of pasture for goats is, I am informed, well known. Every keeper recognises the need of change of locality for breeding pheasants; and the improvement noticeable in fowls, since the system of running them temporarily in different parts of the farm was adopted, instead of keeping them always round the homestead, is attributed to the constant change of feeding-ground.

The reason assigned by some breeders to the fact that pasture will not indefinitely provide suitable food for stock, although there is ample grass so far as quantity is concerned, is that, owing to the method of feeding peculiar to different kinds of stock, they each exhaust that portion which they require.

For this reason it is usual to put sheep on to pasture on which cattle or horses have been feeding for some time, and to put the cattle or horses, where possible, on to the sheep pasture. The practice is attended with good results, but not, I believe, for the reasons frequently assigned.

Sheep will thrive on pasture which has become stale for horses, and, after feeding sheep thereon for some time, and perhaps taking a crop of hay off the sheep-manured land, horses will again thrive on it. The same is true for land which has become stale for sheep; if cattle are turned on, in due time the land will be again fit for pregnant ewes. But if, instead of feeding cattle on the land, it is dressed with cow manure the same benefit accrues.

Again, while roots grown on sheep-manured land are dangerous food for ewes, they are given with impunity to cattle, and although hay from sheep-manured land *may* be bad for ewes, it certainly is not bad for mares in foal.

It appears to me therefore that it is not so much that which is taken out of the land which renders it unfit to support a particular species of animal for an indefinite time, but that it is the material deposited on the land by a particular species which

[1] May it not also be possible that the astonishing staying power of grass-fed horses in Australia and New Zealand is largely due to the fact that they are able to obtain fresh pasture?

either destroys its good qualities for that species or produces a growth which is unsuitable. It may be that the excreta derived from an animal is not the right material wherewith to grow food for that animal, or it may be that the waste products are peculiarly harmful.

In certain parts of the colony of Victoria, where sheep are run in large paddocks of 1,000 to 1,800 acres, they do well there for two or three years, according to the number of sheep kept per acre, but after that time there is a marked deterioration in the ewes, and young lambs do not thrive, in spite of the fact that there is an ample supply of food. The difficulty is overcome there by burning the paddock, and on the scanty fresh grass which rapidly springs up under the blackened débris on the surface, sheep, and especially lambs, thrive with astonishing success.

In this country, where it is possible to give ewes plenty of change, and to allow the land time to rest, either by having ample room for change of pasture where sheep are grass-fed, or by adopting the four-field system where most of the land is cultivated, the disadvantages of sheep-stained land may be avoided; but this is not always possible, and on poor land the difficulty is increased.

Therefore it appears to me to be a reasonable contention on the part of those flockmasters who have so strongly urged on me the importance of the subject, that efforts should be made to obtain an artificial substance, which will either supplement the action of sheep excreta on crops required for sheep, or destroy the evil effects of their continued occupation of the land.

This question touches closely the whole problem of the best form of food for breeding animals. While much attention is paid to the best form of food for fattening stock, the question as to the best form of food for breeding stock and their young is comparatively neglected.

The latter is no doubt by far the more difficult problem, since it deals with the artificial treatment of animals during a period when most complex conditions prevail—I mean the breeding period, when, in all probability, inherited natural instincts are most strongly developed.

But the artificial conditions under which domesticated animals live *necessitates* artificial treatment, and the determination of this problem is all the more important on that account. Anything which tends to the production of more vigorous young animals is of fundamental importance to the breeders of all classes of animals; and I would express a firm belief that no problem presents itself of greater importance than this ques-

tion of the best form of food for breeding stock and their young.

CONCLUSION.

The conclusions to be drawn from this inquiry are, briefly:—

Abortion.—The percentage of aborted ewes is generally low. The age of the ewes, the district and subsoil, the rainfall, may all affect the percentage of abortion in a flock, but the condition of the food given and the resulting condition of the ewes are the primary factors, poor condition being associated with higher abortion returns.

Among Dorset Horns there is a more serious loss, which, it appears possible, may be due to a somewhat general weakness of the generative system of the ewes. Inquiry on this point would be of interest. Among the flocks of Lincoln sheep on the Wolds of Lincolnshire abortion is a still more serious matter; it may even assume an epidemic form, and urgently requires investigation.

Barrenness.—The percentage of barrenness is much in excess of that for abortion, and ewes are undoubtedly more liable to the former than to the latter.

The age of ewes and rams, the proportion of ewes per ram, the changing of rams, the district and subsoil, the rainfall, may all affect the percentage of barrenness in a flock; but again it is the food and resulting condition of rams and ewes which are chiefly responsible.

Fat is undesirable, but undue poorness also leads to barrenness. Poor ewes in improving condition show better results than ewes in good condition which are going back. It is better therefore to have ewes somewhat spare if they are strong than to burden them with too much "condition" at breeding time.

Lincoln sheep on the Wolds suffer most from barrenness.

The need for alteration of show rules, to obviate the necessity for showing rams "fat," is urged by many flockmasters.

The usual percentage of barrenness experienced.—This is in close accord with the returns submitted to me for 1896–97.

The largest per cent. of barrenness experienced.—These records leave no room for doubt that all breeds of sheep are liable to serious losses from this cause, and that it is much more usual than is generally admitted.

The total loss from abortion and barrenness.—The Suffolk and Hampshire Down breeds show the best, and the Lincoln the worst returns.

Fertility.—The percentage of lambs recorded and of twins

born for each breed indicates clearly that fertility in sheep is a racial character; apart from this, those ewes in which the generative system is in the most vigorous and healthy breeding condition are the most fertile, and the condition of the ewes at tupping time is the most important factor. The loss from abortion, barrenness, and death, and the age of ewes and rams, influence the breeding capacity of a flock, but the percentage of twins born is the truest test of fertility, and it is "condition" which exerts the chief influence in this respect.

District, although it may affect fertility, does not affect its racial character, except probably in the Lincoln breed, in which my information suggests that, under different conditions from those experienced in the home county, Lincoln sheep would probably show very considerably higher racial fertility than is indicated by Table I. Apart from fertility there is a high mortality among the lambs on the Lincoln Wolds, and it is obvious that a thorough investigation of the subject would well repay Lincolnshire flockmasters.

The Suffolks are the most fertile breed, and the Southdowns the least prolific, the state of the latter being so low as to merit serious attention.

While the Suffolks are the most fertile with rams of their own breed, the Dorset Horns require crossing with Down rams in order that they may be stimulated to the greatest generative activity; this need for stimulus in the latter breed is in accordance with the remarks made above regarding their liability to abortion.

The use of ram lambs.—In Suffolk, Hampshire Down, and Dorset Horn flocks, the use of ram lambs, while associated with an increased loss from barrenness, is shown to be attended with good results as regards fertility so long as they are not unduly relied upon for breeding purposes.

"*Sheep-stained*" *land.*—The effect upon sheep of food grown with the aid of sheep manure, and the "staining" of land by sheep, are drawn attention to, and the conclusion arrived at that the whole question of the best form of food for breeding animals urgently requires, and would well repay, thorough investigation.

WALTER HEAPE.

Trinity College, Cambridge.

THE BACTERIAL TREATMENT OF SEWAGE.

NEARLY half a century ago two popular books, each written by a distinguished man, created a rage for the Marine Aquarium, and engaged a little army of enthusiasts in an almost fevered raid upon the "Wonders of the Shore."

Kingsley's "Glaucus" was even more influential than Gosse's "Aquarium" in exciting the *furore* in question, and its author, never more energetic than when attempting to weld theology with science, was a magnetic personage who, thus engaged, found many of his younger contemporaries eager to play the hammerman in his smithy.

So it came about that, in the fifties, many of us spent our summer holidays dredging or shore-collecting, astonished and delighted by the strange and beautiful forms of life thus for the first time revealed to us, and anxious to preserve these for observation and study in the aquarium.

How little, in the early days of this enthusiasm, did any "common object of the sea-shore" imagine that his captures, "so various, so beautiful, so new," were to bring him face to face with one of the great questions of the present day—to wit, "The Disposal of Sewage"! I believe—so high did the fever caught from the pages of Gosse and Kingsley then run—that the early devotees of the aquarian cult considered their Radiates, Echinoderms, Molluscoids, and other admired organisms as not only "too bright and good for human nature's daily food" but even for excretion. Be that as it may, they presently learned that the cesspool which had sufficed for them and their forefathers was not good enough for the dwellers in the aquarium, who soon drooped and died in the absence of a proper system of sewage disposal.

Complete change of air, or, in this case, of water, was the first and obvious remedy that suggested itself, and recourse was accordingly had to local purveyors of sea water, who, not enthusiastic naturalists themselves, cared little where they dipped their buckets and, as often as not, supplied a dilution of their own town drains.

The chemist next offered a recipe for home-made salt water which, upon trial, sickened the "sea-beasts" almost equally with the 'longshoreman's decoctions; but a step in the right direction was taken when Mr. Warington, in 1850, read a paper before the Chemical Society "On the adjustment of the relations

between the animal and vegetable kingdoms, by which the vital functions of both are permanently maintained."

Seizing upon the hypothesis, first formulated by Daubeny in 1833, of a "life cycle" wherein the plant, under the influence of sunlight, furnishes the animal with oxygen, without which it cannot live, while the animal excretes, so to speak, carbonic acid, an equally vital necessity for the plant, the aquarians began to decorate their submarine cities with beautiful sea-weeds, which, chosen in ignorance of their proper environment, perished miserably with the creatures they were intended to succour. Later, they learned by experience that only a few unsightly weeds of confervoid type can endure the conditions of life in a marine tank, while even these proved unable to furnish oxygen enough for any but very small colonies of animals.

If, indeed, we now compared one of our rather gloomy "gardens of Nereus" with a tidal rock-pool, what a sad contrast was there! On the one hand, a collection of dead-alive creatures, scattered among unsightly vegetation; on the other, a basin brimming with crystalline water, sparkling like champagne in the breeze, and having every square inch of its surface clothed with an extraordinary variety of organisms in the enjoyment of vigorous health—"a city in the sea," more populous, relatively to its area, than London, yet cleaner than a Shaker village or a Japanese gentleman's house.

Musing over Nature's own Aquaria, the disciple of Gosse and Kingsley presently realised that while oxygen was, indeed, the one thing needful for the health of his little cosmos, this must be supplied, not in trickling streams of tiny bubbles, rising under the influence of a dim London sun from conferva-covered stones, but in lavish abundance. So the machinist was, finally, asked for pumps and pipes, whereby large supplies of air might be continuously supplied to the aquarium. This was no sooner done than the mimic ocean cleared, the "beasts" regained some of their vigour, and large additions were made to their numbers without detriment to the health of the community. The aquarian, indeed, had begun to practise, in his self-contained little world, the Bacterial Treatment of Sewage, having, however, no knowledge of its principles, but coming near, in his play, to making a great biological discovery—that, namely, with which Pasteur, only a few years later, startled the scientific world in demonstrating the functions of certain lowly organisms whose manipulation of oxygen has sanified the whole world since the beginning of things.

The sewage of a town unsupplied with water-closets consists of the liquid excretions of its inhabitants; foul water from many sources, such as kitchens, laundries, stables, styes, and slaughter-houses; the swillings of yards; and the solid and liquid excretions of animals in the street. These, in water-closeted towns, are supplemented by the solid excreta of the inhabitants themselves, which, however, find their way into the sewers so largely diluted with clean water that the strength of the sewage, whether of closeted or uncloseted towns, is practically alike.

This fact, together with the great convenience of water-carriage, has turned the scale so decidedly in favour of the closet system that the question will be treated in this article as closed, and nothing consequently said about dry, or quasi-dry, plans of sewage disposal. Should there, however, remain any who still halt between two opinions as to whether the excreta of towns should be dealt with by dry earth, the pail, or water-carriage, let him consider the following views of Sir Robert Rawlinson, very trenchantly expressed more than ten years ago:—

> If any imagine that towns can be dealt with on the dry earth system, I pity their ignorance. If they think towns can be dealt with on the pail system, I only wish they could see those pails manipulated, for, if compelled to do so, they would start back in horror from the idea of such a system being continued.[1]

Sewage is a highly complex, variable, and very putrescible compound, an average sample of which contains about 100 grains of solid matter in the gallon, 70 grains being held in suspension and 30 in solution,[2] while of the former about two-thirds, and of the latter rather less than one-third, consists of organic matter, the remainder being mineral in its character.

Nearly all the suspended matter and a fraction of that in solution can be removed by precipitation assisted by chemicals of various kinds, such processes about half purifying the sewage. After the removal of its suspended matter there would, however, remain in the sewage in question some 20 grains of dissolved organic matter which cannot be removed and must, therefore, be oxidised (or burnt) if the final effluent is to enter a stream with its affinity for oxygen satisfied to such a degree that it will not abstract therefrom further supplies of an element necessary for the life and health of the fauna and flora inhabiting river water.

All the organic matters in sewage, chief among which are gelatine, albumen, cellulose, starch, and fats, contain oxygen in volumes, varying with the substances themselves, of

[1] *Proc. Soc. Arts*, April 1888.

[2] Barwise.

between the animal and vegetable kingdoms, by which the vital functions of both are permanently maintained."

Seizing upon the hypothesis, first formulated by Daubeny in 1833, of a "life cycle" wherein the plant, under the influence of sunlight, furnishes the animal with oxygen, without which it cannot live, while the animal excretes, so to speak, carbonic acid, an equally vital necessity for the plant, the aquarians began to decorate their submarine cities with beautiful sea-weeds, which, chosen in ignorance of their proper environment, perished miserably with the creatures they were intended to succour. Later, they learned by experience that only a few unsightly weeds of confervoid type can endure the conditions of life in a marine tank, while even these proved unable to furnish oxygen enough for any but very small colonies of animals.

If, indeed, we now compared one of our rather gloomy "gardens of Nereus" with a tidal rock-pool, what a sad contrast was there! On the one hand, a collection of dead-alive creatures, scattered among unsightly vegetation; on the other, a basin brimming with crystalline water, sparkling like champagne in the breeze, and having every square inch of its surface clothed with an extraordinary variety of organisms in the enjoyment of vigorous health—"a city in the sea," more populous, relatively to its area, than London, yet cleaner than a Shaker village or a Japanese gentleman's house.

Musing over Nature's own Aquaria, the disciple of Gosse and Kingsley presently realised that while oxygen was, indeed, the one thing needful for the health of his little cosmos, this must be supplied, not in trickling streams of tiny bubbles, rising under the influence of a dim London sun from conferva-covered stones, but in lavish abundance. So the machinist was, finally, asked for pumps and pipes, whereby large supplies of air might be continuously supplied to the aquarium. This was no sooner done than the mimic ocean cleared, the "beasts" regained some of their vigour, and large additions were made to their numbers without detriment to the health of the community. The aquarian, indeed, had begun to practise, in his self-contained little world, the Bacterial Treatment of Sewage, having, however, no knowledge of its principles, but coming near, in his play, to making a great biological discovery—that, namely, with which Pasteur, only a few years later, startled the scientific world in demonstrating the functions of certain lowly organisms whose manipulation of oxygen has sanified the whole world since the beginning of things.

The sewage of a town unsupplied with water-closets consists of the liquid excretions of its inhabitants; foul water from many sources, such as kitchens, laundries, stables, styes, and slaughter-houses; the swillings of yards; and the solid and liquid excretions of animals in the street. These, in water-closeted towns, are supplemented by the solid excreta of the inhabitants themselves, which, however, find their way into the sewers so largely diluted with clean water that the strength of the sewage, whether of closeted or uncloseted towns, is practically alike.

This fact, together with the great convenience of water-carriage, has turned the scale so decidedly in favour of the closet system that the question will be treated in this article as closed, and nothing consequently said about dry, or quasi-dry, plans of sewage disposal. Should there, however, remain any who still halt between two opinions as to whether the excreta of towns should be dealt with by dry earth, the pail, or water-carriage, let him consider the following views of Sir Robert Rawlinson, very trenchantly expressed more than ten years ago:—

> If any imagine that towns can be dealt with on the dry earth system, I pity their ignorance. If they think towns can be dealt with on the pail system, I only wish they could see those pails manipulated, for, if compelled to do so, they would start back in horror from the idea of such a system being continued.[1]

Sewage is a highly complex, variable, and very putrescible compound, an average sample of which contains about 100 grains of solid matter in the gallon, 70 grains being held in suspension and 30 in solution,[2] while of the former about two-thirds, and of the latter rather less than one-third, consists of organic matter, the remainder being mineral in its character.

Nearly all the suspended matter and a fraction of that in solution can be removed by precipitation assisted by chemicals of various kinds, such processes about half purifying the sewage. After the removal of its suspended matter there would, however, remain in the sewage in question some 20 grains of dissolved organic matter which cannot be removed and must, therefore, be oxidised (or burnt) if the final effluent is to enter a stream with its affinity for oxygen satisfied to such a degree that it will not abstract therefrom further supplies of an element necessary for the life and health of the fauna and flora inhabiting river water.

All the organic matters in sewage, chief among which are gelatine, albumen, cellulose, starch, and fats, contain oxygen in volumes, varying with the substances themselves, of

---

[1] *Proc. Soc. Arts*, April 1888. [2] Barwise.

from 12 to 50 per cent., but very large additions of the gas in question would be required in each case to bring about complete oxidation. Albumen, for example, would demand ten times, and the fats thirty times more oxygen than they respectively contain, in order to accomplish this end.

When, therefore, the fact is borne in mind that the only available source of oxygen is the atmosphere, where, however, it exists diluted with four times its own volume of nitrogen, it becomes clear that, as the old aquarians found, the purification of foul water by oxygenation is not an easy task, while the problem of how to bring oxygen into chemical combination with organic matter is an extremely obscure one.

Many years ago, Sir Edward Frankland, summarising the laboratory work of the Royal Commission on the Pollution of Rivers, laid great stress on the fact that almost any process of precipitation would suffice for the removal of organic impurities *suspended* in sewage, while it was very difficult to deal with similar matters in *solution*; and this dictum led the sanitary authorities of that day to carry the former process as far as they possibly could, in order to lessen the burden of the latter and more onerous task. No sanitary engineer would, then, have attempted to throw these suspended matters into solution as is now done under the bacterial treatment, so that all the earlier and most of the existing systems of sewage disposal began, and sometimes ended, in precipitation by chemicals.

All sorts of substances have been used for this purpose, but lime, alum, and sulphate of iron are the only ingredients now commonly employed. When treated by one or other of these reagents, crude sewage deposits, after resting for a time in a suitable tank, a thick black mud known as "sludge," and after this has been removed by the sludge-pump, the remaining fluid, still charged with its dissolved impurities, is either distributed broadcast over a sewage farm or subjected to what is called "intermittent downward filtration" through some six feet of soil, preparatory to its discharge into the nearest stream.

Sludge is literally the *bête noire* of the sanitary engineer. Its manurial value, once greatly over-estimated, was proved to be trifling by the experiments of the Royal Commission of 1858–65, and the stuff itself cannot be brought into the market until it has been first pressed into "cake," a process costing as much, or more, than the so-called manure is worth. This filthy mud, which undergoes a rapid decomposition of the most offensive character, is, in the words of Mr. Santo Crimp, "a material to be got rid of as cheaply as possible," and that is why the cities of London and Manchester are barging it out to sea, while

Glasgow prepares to follow their example. This operation, in the case of the Metropolis, costs 4*d.* a ton, and is performed by a fleet of six specially constructed steamers, which, together, cost more than 140,000*l.*

Broad irrigation, or sewage-farming, great as were the hopes once entertained of it, has been long ago appraised at a very moderate value by practical agriculturists, and is not now warmly supported, even by theorists. Although the land is the only proper ultimate receptacle for all the effete matters in the sub-aërial world, these must reach the soil in a form assimilable by plants, or mischief will ensue. In the case of sewage-farming, however, sufficient notice has not been taken of the fact that it is not Nature's way to concentrate the excreta of large communities on a few acres of land, or to dose those acres daily with dirty water whether they, or the crops they bear, are, or are not, in a proper condition to receive the flood.

There are doubtless some localities where the nature of the soil permits of this being done with comparative impunity, but, even in those rare cases where the circumstances are most favourable to broad irrigation, this method of dealing with sewage issues in unsatisfactory results, because of the many variable and uncontrollable conditions under which it must be carried on. If the farm be dosed with crude sewage, the surface of the land becomes coated locally with an impervious slime which, by putting an end to absorption in certain spots, gives rise to pestiferous lagoons in various stages of decomposition, rendering the fields a widespread nuisance. If, on the other hand, the effluent from precipitation tanks be used, this may, indeed, be harmlessly disposed of on a suitable soil; but the local authorities remain saddled with quantities of sludge which they do not know how to get rid of, and cannot everywhere barge out to sea.

Between these two stools broad irrigation has come to the ground. While primarily and properly aiming to bring sewage under the purifying influence of the soil, it does so in such a haphazard way that the micro-organisms, by whose agency alone, it is now known, organic matter is oxidised, and so rendered fit for use by the plant, are never placed in advantageous or even tolerable conditions for the performance of their appointed work.

The creed of Chadwick and his followers, very popular in the forties, that liquid was preferable to solid manure at all times, on all soils, and for all crops, had already been greatly weakened by the teachings of experience; and the difficulty of procuring enough and efficient land for the purpose of irrigation

was also pressing hardly on the advocates of sewage-farming when Sir Edward Frankland turned his attention to the question of "downward filtration."[1] He proved by laboratory experiments that if a suitable soil, neither too close nor too open, were underdrained at a depth of about six feet, dosed for six hours with sewage, and afterwards allowed to rest empty for six hours, an effluent would result which might be safely discharged into any stream. He further claimed that one acre of land, thus treated, would suffice to purify the sewage derivable from a population numbering three or four thousand—or from fifty to one hundred thousand gallons per day—the acre being divided into twelve equal parts, of which each successively received the whole flow for six hours.

Frankland's estimate of what an acre of land could thus accomplish proved fallacious in practice, but his plan of downward filtration tided over a difficulty, although it is now known that only twenty thousand gallons a day, or the quantity derivable, at twenty gallons per head, from one thousand people, can be satisfactorily dealt with upon one acre by this method.

The necessity of intermittence in the flow, for the purpose of thoroughly aërating the soil between each dose, was insisted upon by Frankland as a *sine quâ non*, and a limited but undefined amount of assistance was expected from the nitrifying microbes known to exist in the soil. Certain experiments of the State of Massachusetts Board of Health made in 1888–90, to be more fully referred to hereafter, have, however, demonstrated in great detail what Warington and others had already discovered, that while countless myriads of the organisms in question exist in the topmost layer of the soil, their numbers decrease very rapidly with every inch of depth, becoming a negligible quantity one foot below the surface. Little, therefore, in the case of downward filtration through six feet of soil, could be obtained in the way of assistance from those micro-organisms, which, as will presently appear, are the sole agents in the purification of sewage. Oxygenation was relied upon as the chief scavenger; but, like the old aquarians, no one knew exactly how this servant went about his work, and meanwhile the real sweepers were heavily handicapped by the conditions of life imposed upon them by the sanitary engineer of that day.

Sewage has been already designated a highly putrescible compound—one, that is to say, which enters quickly and easily into a condition of putrid fermentation, the last a word requiring

[1] First Report of River Pollution Commission.

definition before it is possible to explain the bacterial treatment of sewage. Huxley, in his essay on "Yeast," says:—

> It is highly creditable to the ingenuity of our ancestors that the peculiar property of fermented liquids, in virtue of which they "make glad the heart of man," seems to have been known in the remotest period of which we have any record. All savages take to alcoholic fluids as "to the manner born." Noah, by a natural reaction against a superfluity of water, appears to have taken the earliest opportunity of qualifying that which he was obliged to drink, and the ghosts of the ancient Egyptians were solaced by pictures of banquets, in which the wine cup passes round, graven on the walls of their tombs. A knowledge of fermentation was in all probability, therefore, possessed by the prehistoric populations of the globe.

But the first step towards the explanation of this process was not taken till towards the close of the seventeenth century, when Leeuwenhoeck, the Dutch draper-naturalist, using the first microscope ever constructed, discovered that yeast had a definite structure resembling tiny globules of matter floating in a fluid. Leeuwenhoeck did not penetrate to the meaning of the fact he had observed, and more than a century and a half elapsed before his "globules" were announced, by Cagniard Latour and Turpin in France, and by Schwann and Kützing in Germany, to be living organisms allied to the fungi, which multiplied with amazing rapidity by a process of budding.

All four of these investigators believed, though Turpin was the first to formulate the hypothesis, that the fermentation of saccharine fluids was due to the presence of *Torula Cerevisiœ* (as he named the yeast plant); and since it was found that only living *torulœ* could bring about the fermentation in question, he boldly concluded that the decomposition of sugar into alcohol and carbonic acid—the chief products of saccharine fermentation—was a vital and not a chemical process.

The vitalistic theory of fermentation was vehemently opposed by Liebig, then the oracle of the chemical world; nor was the doubt thus thrown upon the brilliant work of Latour and his fellows dispelled, until Pasteur, who first turned his attention to this subject in the fifties, brought forward such convincing proof of its truth as compelled its acceptance by the scientific world.

Passing later from the consideration of fermentations, such as the vinous one, which issue in products harmless to man, this investigator attacked those having putrid and harmful products, and was not long in announcing that these also are solely dependent on the presence in putrescible liquids of living organisms. It had, indeed, been long known that microscopic "animalculæ" accompanied decomposition, but it was reserved for Pasteur to show that microbial life is its sole cause; thus,

for the first time, revealing the stupendous importance of micro-organisms in the economy of Nature. The great Frenchman's conclusions have been well stated by his colleague Duclaux, Director of the Pasteur Institute, in the following words:—

> Whenever and wherever there is a decomposition of organic matter, whether it be the case of a herb or an oak, of a worm or a whale, the work is exclusively done by infinitely small organisms. They are the important, almost the only, agents of universal hygiene; they clear away more quickly than the dogs of Constantinople, or the wild beasts of the desert, the remains of all that had life; they protect the living against the dead; they do more: if there are still living beings, if, since the hundreds of centuries the world has been inhabited, life continues, it is to them we owe it.

In the course of a research on the butyric fermentation, Pasteur discovered that while ferments such as yeast or the vinegar plant (*Mycoderma*), whose vital activities result in harmless products, can live only in the presence of oxygen, those, on the other hand, which give rise to putrescence cannot co-exist with an element which, up to that time, had been universally regarded the *sine quâ non* of all life.

This discovery raised a storm of angry opposition, but none the less did its author establish the distinction in question, that, namely, between anaerobic and aerobic organisms, of whom the former, taking oxygen from the unassimilable elements of the effete substances forming their food, induce putrescent decomposition; while the latter, reversing this process, exchange oxygen derived from the air with the unassimilable elements of their food, a process of oxidation, or slow combustion, resulting in harmless mineral products.

More than forty years have elapsed since Pasteur demonstrated that there can be no fermentation in the absence of organisms, the sole agents employed by Nature in breaking down into simpler and simpler forms all the organic débris of the world, until it is finally reduced to such substances as nitrates, ammonia, carbonic acid, and water, which can be assimilated by the plant. During all that time, however, the methods of sewage disposal have remained half-hearted attempts to assist the world's scavengers in their appointed work—half-hearted, because only a few minds have been able to realise the scope of a mission whose work, like that of the cell in plants and animals, is carried on by unseen and almost inconceivable agencies. Hence, probably, it comes about that the sludge tank and broad irrigation are still employed by sanitary engineers—Agrippas, "almost persuaded" to become Pasteurists—with a view of lightening labours adjudged too great for the unaided microbe; while such work as might be hoped for from him,

whether on the sewage farm, or in Frankland's filters, is carried on under conditions by no means favourable to microbial life.

To improve and if possible perfect these conditions, or, in other words, to hasten the process of natural putrefaction, is the object sought by the bacterial treatment of sewage, whose advocates contend that since the cleansing of the whole world is accomplished, either slowly or rapidly, by the agents in question, it is the business of art to assist in their work creatures whom not one man in ten thousand has seen, and of whom no man, as yet, knows anything except by their works.

The attention of sanitarians in this country was first definitely called to this subject as a practical project by certain experiments, already alluded to, made in the years 1888–90 by the State of Massachusetts Board of Health on the sewage of Lawrence, a town on the river Merrimac, in that State. These elaborate trials were intended to determine what are the best materials for use in sewage filters, and to put the question of their aëration on a scientific basis.[1] They issued in proving that the conditions essential to the success of sewage filtration are "very slow motion of very thin films of liquid over the surfaces of particles having spaces between them sufficient to allow air to be in continual contact with the films of liquid," and in the further necessity for the presence of "certain bacteria to aid in the process of nitrification." In addition, they demonstrated very clearly the necessity for making the supply of sewage to the filter intermittent, and showed a percentage of purification which had never been obtained before. Of ten filters employed, each containing a different material, four or five removed by oxidation 99 per cent. of the nitrogenous impurities contained in the crude sewage, giving effluents which included, to quote the words of the Report, "less organic impurities, as shown by chemical analysis, than most of the drinking water supplies of the State."[2]

The Massachusetts experiments created so great an interest in this country that they were speedily supplemented by others, having purely biological objects, undertaken between the years 1892–95 by the London County Council, under the superintendence of their chemist, Mr. Dibdin.[3] It will be noted that no attempt was made at the Lawrence station to promote the putrefactive fermentation of sewage by cultivation of the anaerobic organisms, but that raw sewage, of a somewhat weak

---

[1] *Report of Massachusetts Board of Health on Sewage Purification*, 1890, p. 579.

[2] *Report*, p. 582.

[3] *London County Council Reports*, No. 246.

character it is true, had been treated in carefully aërated filters which were presumably tenanted by aerobic organisms only.

Mr. Dibdin fell into line with the American experimenters in this regard, and began by constructing at the Barking outfall four small filters, which he charged respectively with burnt ballast, broken coke, shingle, and sand. These were dosed intermittently with effluent from the Barking precipitation tanks, thus freed from all suspended impurities. The coke filter was found to give the best results, and these were considered sufficiently good to justify the construction of a filter having an area of one acre, in order to test the process on a practical scale.

Small quantities of the tank effluent were at first applied, the filter being filled and emptied twice daily, with a view to getting it into the necessary biological condition. This treatment was commenced on April 2, 1894, and continued for a few weeks until, with a flow of 500,000 gallons per day, a purification of from 70 to 80 per cent. resulted, the highest state of efficiency being, however, obtained on May 3, when, after a month's working, the purification reached 83 per cent., and fish placed in the filtrate lived for many weeks. These remarkable results were surpassed when, upon the flow of tank effluent being increased from 500,000 gallons to 1,000,000 gallons per day, the filtrate remained clear and sweet while the purification fell off by only 5 per cent.

Mr. Dibdin's experiments were carried on under presumably aerobic conditions, ensured by the intermittent aëration of his filters, and had for their sole object the oxidation of such soluble organic matter as remained in the sewage after it had been deprived, by chemical precipitation, of all suspended impurities. But, meanwhile, and some time prior to the date of the London County Council's experiments, or in 1891, Mr. Scott-Moncrieff had begun to study the "biolysis," as he terms it, of sewage; basing his investigations on the consideration that since *all* effete substances can be dealt with by Nature without assistance from chemicals, the problem resolves itself into discovering such artificial methods as would enable this agency to deal with the impurities contained in sewage on any scale, however large, at a reasonable cost, without creating a nuisance, and without the use of chemicals.

With these objects in view Mr. Scott-Moncrieff dispenses with the sludge tank, and runs crude sewage through the inlet A (fig. 1), into a chamber, B, having a grated false bottom, C. This carries a layer of flints about 14 inches in thickness, through which the sewage, taking the course indicated by the

arrow, flows slowly but continuously upward and onward to the outlet, E, situated a few inches below the surface of the flint-bed. A catch-pit, F, arrests such gravel and sand as may enter with the sewage, and the whole arrangement constitutes what

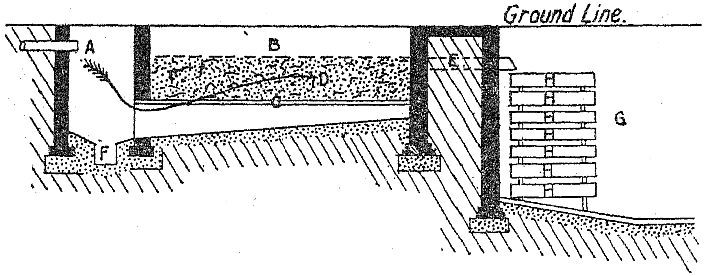


Fig. 1.—Longitudinal section through "cultivation tank."

Mr. Scott-Moncrieff calls a "cultivation tank" or nidus, suitable for the growth and multiplication of the anaerobic organisms—those, namely, that live in the absence of oxygen, and give rise to putrescent fermentation.

These, as the researches of bacteriologists have shown, are the microbes chiefly concerned in breaking down into simpler compounds, and finally liquefying, the organic matters present in sewage, a particle of which may, by way of illustration, be regarded as a house of cards, while an anaerobe may represent the child who, attempting to take the building down, removes a card here, with a certain amount of ruin as the result, and another there, with more ruin following, until, after several of such abstractions, the whole edifice collapses. A fragment of organic matter suspended in sewage is such a card-house, while the cards themselves are the molecules of which the substance is built up, and a microbe attacking, as food, any given molecule of the compound body in question, will effect a certain change in its character, while further following attacks by other microbes, having each, it may be, his own taste in molecules, will finally reduce it to a condition in which it becomes soluble in water.

To return to the "cultivation tank." The fresh sewage, not yet deprived in the sewers of all its oxygen, is attacked, on entrance, by aerobic organisms who, as the vital element at their command in the influent becomes exhausted, leave what remains of the food supply to such anaerobes as find a congenial home in the upper and airless layers of the flint-bed. These so thoroughly complete the work of decomposition and final liquefaction that practically no sludge results, while the effluent

contains all the solids and liquids which were present in the raw sewage, dissolved into simpler forms, indeed, but also minus a considerable proportion of the original impurities, which have disappeared by conversion into carbonic acid, marsh gas, hydrogen, and nitrogen.

Such an effluent is well suited for throwing upon the land whose swarming aerobes would rapidly oxidise it; or it might be at once discharged into a stream of four or five times its volume, the instability of its nitrogenous contents being now so great that their complete oxidation would be thus rapidly and harmlessly accomplished. But "a counsel of perfection" suggested to Mr. Scott-Moncrieff that if sufficient assistance were given to the operations of the aerobic organisms the work of nitrification might, without cost, be carried so far as to produce a filtrate having nitrates enough in solution to make it a commercially valuable product. He therefore supplements his cultivation tank with a nitrifying chamber, G (see fig. 1), consisting of several shallow trays, H, H, H, vertically arranged and separated from each other by a few inches of air space. Each tray contains a layer of finely broken coke a few inches in thickness, and the topmost of these is evenly dosed at regular intervals with such quantities of the tank effluent as would represent a flow of 1,000,000 gallons per acre per twenty-four hours—a convenient unit for purposes of calculation. The fluid so supplied falls through tray after tray until, on reaching the last of the series, it is found to contain, in every 100,000 parts, from seven to nine parts of nitrates, equivalent to the mineralisation of 90 per cent. of the total organic matter contained in the effluent from the cultivation tank.

This almost complete oxidation is due to the fact that, the process of nitrification being a progressive one, no two trays contain an exactly similar food supply, and no one kind of organism can be capable, therefore, of flourishing equally well in all the different stages of the process. That this is actually the case is proved by the simple experiment of disarranging the trays—putting No. 7, for instance, in the place of No. 2, and *vice versâ*—when nitrification is arrested, the filtrate becoming foul, and so remaining until, after the lapse of some days, a readjustment of the organisms to their environment takes place and oxidation goes on as before the disturbance. Nitrification proceeds with extraordinary rapidity in the trays, scarcely ten minutes elapsing before any given dose of effluent finds its way through them all, issuing with its organic contents almost completely mineralised.

The use of trays arranged in a vertical sequence obviously

permits of a step by step analysis, together with a graphic representation of the changes taking place in each member of the series, and the accompanying diagram (fig. 2) exhibits in a striking way the progressive conversion of organic matter into nitrates, omitting other changes, of less interest to the agriculturist than the chemist, which might also be shown.

The production of nitrates, whether in the Massachusetts or Barking experiments, was treated as a matter of secondary consideration, their appearance in the filtrates (never exceeding one part in 100,000 parts) being only regarded as evidence that enough of the organic matter passing through the filter had been oxidised to prevent any undue demands being made

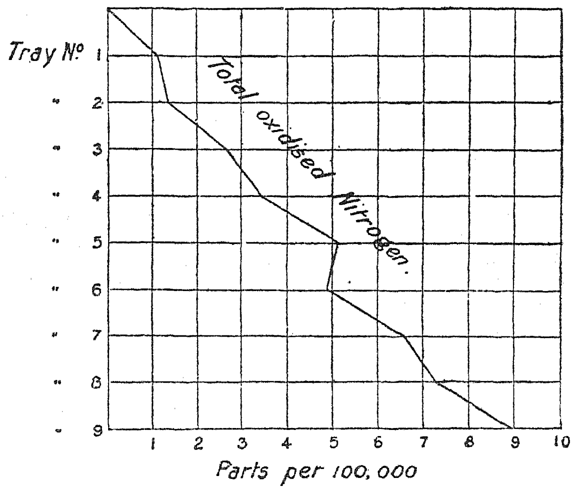


FIG. 2.—Chart showing nitrification which occurs in successive stages of purification.

upon the stream for further supplies of oxygen. If, however, as Mr. Scott-Moncrieff predicts, the final product of properly biolysed sewage will contain such a percentage of nitrates as will render it a valuable plant food, it may not, perhaps, prove a mere inventor's dream that there will presently gather around the sewer outlets of towns and cities, acres of glass-houses whose abnormally large products, whether of fruit, flowers, or vegetables, will more than pay interest of money on their first cost.

To pass, however, from fancy to fact, Sutton, a town in Surrey, of 17,000 inhabitants, was the first place in England to adopt the bacterial treatment of its sewage, which previously to 1894 had been dealt with, first, by chemical precipitation,

and afterwards by broad irrigation over some twenty acres of land.

The daily flow of the sewage of Sutton amounts to 400,000 gallons, each gallon containing 60 grains of organic matter in suspension, while the farm upon which, prior to 1894, this was distributed, consists of heavy clay, whence, says Mr. Chambers Smith, the urban council's surveyor, "it was frequently impossible to produce an effluent such as would satisfy the requirements of the Thames Conservators; purification by broad irrigation on stiff clay soil being a matter of extreme difficulty, especially when it is endeavoured to raise crops at the same time."[1] Not only did the land treatment result badly at Sutton, but the sludge from the precipitation tanks was found to be quite unsaleable, and the surveyor was often at his wits' end how to dispose of it without himself creating a serious nuisance.

In these circumstances the council, advised by Mr. Dibdin, laid down filter beds similar to those employed by the London County Council at Barking, wherewith to deal, in the first instance, with half the sewage of the town, amounting to 200,000 gallons per twenty-four hours. The sludge tanks were retained in use, and their effluent intermittently delivered to the coke filters in precisely the same way as had been done at Barking. The results proved satisfactory, 74 per cent. of the organic matters contained in the tank effluent being removed and a filtrate which satisfied the requirements of the Thames Conservators delivered to the brook.

Two years later, in October 1896, Mr. Dibdin, influenced probably by certain results obtained in the meantime by Mr. Scott-Moncrieff and Mr. Cameron, the city surveyor of Exeter, whose "septic tank" will be presently described, advised the Sutton Council to supplement their coke filters by what he called a "bacteria bed," being a coarse-grained duplicate of the existing filters, charged with burnt ballast instead of coke. The use of the sludge tank was now abandoned and the crude sewage poured over the "bacteria bed," but intermittently, with a view to the aëration of the latter and the consequent encouragement of the aerobic microbes to whose care, instead of the putrefactive anaerobes, the task of breaking up and ultimately dissolving the organic matters suspended in the sewage was thus confided.

It is a question with some chemists[2] and bacteriologists whether Mr. Dibdin's "bacteria bed" is entirely, or only par-

[1] Report of Surveyor to Surrey Urban Council, February 1898.
[2] Dr. Rideal's paper before the Sanitary Institute, Birmingham, 1898.

tially, aerobic in its action; whether, that is to say, the suspended impurities are attacked therein by a mob or by a disciplined army of organisms, a question of great practical importance in correlating the dimensions of biolytic beds with the work to be done in them. Be this as it may, the effluent from the bacteria bed is practically free from any organic matter in suspension, while the filtrate subsequently derived from the coke beds issues minus some 99 per cent. of its original impurities.[1] This filtrate is a clear, odourless fluid, which keeps unchanged in closed or open vessels for any length of time, satisfies the demands of the Thames Conservancy, and has even been drunk by bold men without ill-effects following.

Mr. Chambers Smith's report,[2] already quoted, states that previously to the introduction of the present system of sewage treatment, Sutton spent 1,250*l.* per annum on chemicals, sludge-pressing, and farm operations, without producing a satisfactory effluent; but when, as the urban council intend, the bacterial plant has been extended sufficiently to deal with the whole, instead of half the sewage of the town, the annual cost of working will not exceed 700*l.* Meanwhile the farm will be available, for sale, or use as a recreation ground, little more than an acre of space being required for filter beds capable of dealing with 400,000 gallons of sewage in every twenty-four hours.

Mr. Cameron, the city surveyor of Exeter, is a third investigator whose "septic" system of sewage purification was adopted by his own council in 1896 for the treatment of the sewage derived from St. Leonards, a suburb of the city, having a population of 1,500 souls, and a flow of sewage averaging 54,000 gallons per twenty-four hours, each gallon containing 24½ grains of suspended matter—a weak compound, it may be remarked, in comparison with that of Sutton.

Crude sewage, in this case, is allowed to run direct from the drains into the "septic tank," A (fig. 3), a chamber hermetically closed to light and air, and of sufficient capacity for the reception of one day's flow. Such gravel and sand as accompany the sewage are arrested in the catch-pit, B, and the liquid then passes, very slowly, to the outlet, C, its contained impurities thus resting for twenty-four hours in the chamber. There it is attacked by organisms of the anaerobic type, for whose operations the airless space is designed, and who can be watched at their work from the tower, D, occupying the centre of the tank and accessible by the manhole, E. From

[1] Dibdin, *Purification of Sewage*, p. 65.
[2] Report of Surveyor to Surrey Urban Council, February 1898.

the windows with which the watch-tower is furnished, a leathery scum is observed to float on the surface of the contained fluid, while the floor is covered with a deposit of heavier matter. Both the scum and deposit are densely peopled with micro-organisms, which bring about a constant transference of particles from the upper to the lower layer, and *vice versâ*, in the following way: As the organic substances in the scum become decomposed under the anaerobic attack, their débris, or ash, drags here and there a particle to the bottom where other microbes fall upon it, and by further rearrangements of its molecules give rise to bubbles of gas which buoy it back to the surface. There the bubbles burst, the particle once more falling, but only to be lifted again and again in the same manner until it is quite decomposed. The septic chamber is alive with these rising and falling particles which, in the course of their endless journeys, bring the liquefying anaerobes into contact with all the suspended matter diffused throughout the

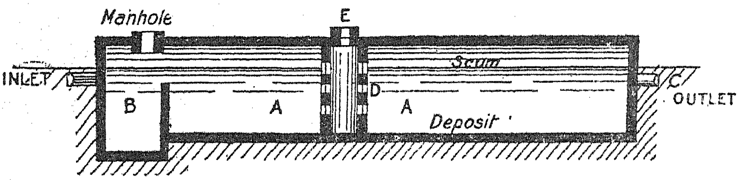


FIG. 3.—Longitudinal section of "septic tank."

tank, gas meanwhile accumulating in the roof, whence, not being itself an illuminant, it is carried to Welsbach burners that light the works.

During the first year's experience of the Exeter "septic tank," the scum varied in thickness from 4 inches in winter to 1 inch in summer, while the heavy deposit amounted in the same period to some $5\frac{1}{2}$ tons, representing a loss of 20 grains out of $24\frac{1}{2}$ grains of the suspended matter originally contained in the raw sewage.[1] Practically no sludge is produced, such substances as paper, rags, and even feathers disappearing in the chamber; while the heavy deposit is found, on examination, to consist of an insoluble residue, or ash, derived from the decomposition of organic matter, mixed with a large proportion of mineral matter too finely divided for arrestation by the catch-pit.

The effluent from the "septic tank," having its suspended matter thus thrown into solution, is suitable for land treatment, but is disposed of at Exeter upon nitrifying aerobic

[1] Cameron's Report: Leeds Congress of the Sanitary Institute, 1897.

filters, similar to those employed at Sutton and already described. Five of these are provided, so that while four are being alternately and intermittently charged a fifth rests. Filling and emptying are accomplished automatically by means of a device, the invention of Mr. Cameron, which reduces the amount of manual labour required for the management of the plant to a mere trifle.

The nitrifying filters occupy a space of 400 square yards, while the septic chamber itself has an area of 130 square yards, making together, 530 square yards, or say one-ninth of an acre. Upon this small space, with a minimum of labour, without the use of chemicals, the production of sludge, or the creation of any nuisance, the excreta of 1,500 people are dealt with by Nature's scavengers, while the filtrate which ultimately reaches the Exe has, like that at Sutton, been drunk by bold men with impunity.

Although many towns, other than Sutton and Exeter, which were recently nicknamed the Mecca and Medina of the sanitary engineer, have already adopted, or are about to adopt the Bacterial Treatment of Sewage, the time has not yet arrived for expressing an opinion on any of the plans described, or for an economic presentment of the case for biolysis. Some figures, which are not estimates, have, by the kindness of Mr. Chambers Smith, been quoted, but it must be remembered that a good deal of pioneer work was done and expense incurred at Sutton which will be saved in future installations on the same principle.

It has been questioned whether the biolytic treatment of sewage might not add to such dangers as communities already run from pathogenic germs, whose multiplication may presumably be encouraged in bacteria beds and filters. Not everything is at present known as to the ways of the wily microbe, but already the biologist is prepared to give him good testimonials in this regard. "The putrefactive germs," says Dr. Sims Woodhead, "have nothing to do with the production of disease under natural conditions; in fact, the addition of large quantities of such germs is said to interfere with the action of, or even entirely destroy, many disease-producing germs." This gentleman's experiments at Exeter further demonstrate "that crude sewages containing about half a million organisms per cubic centimetre, when inoculated into the filtered effluent of a septic tank, developed more than a thousand millions in five days, thus overwhelming any pathogenic germs that might be present."[1]

[1] Dr. Rideal's paper, Sanitary Institute, Birmingham, 1898.

Dr. Pickard specially investigated the typhoid microbe with reference to the action upon it—first, of crude sewage, second, of the septic tank, and third, of the coke filter; finding that sewage "is not only a bad food, but an actual poison" to this bacterion; that in the septic tank it suffered rapid destruction; and that the filter beds effect a further biological elimination; "so that there is no chance whatever of the filtrate causing typhoid fever if passed into the river."

Dr. Rideal, a third authority, takes the same view, remarking in the paper already referred to: "It is well known that the pathogenic bacteria do not, fortunately, thrive much below blood heat, and that they are rapidly crowded out and destroyed by the ordinary bacteria existing in common waters, and still more so by the immense numbers existing in sewage." These conclusions are confirmed by the bacteriological results obtained in the experiments made at Lawrence, where special attention was paid by skilled biologists to the point in question, which there, as here, was resolved in favour of the microbe.

A further problem has yet to be considered—that, namely, of the suitability of the bacterial treatment for the sewage of manufacturing towns, where the drains are charged with various matters presumably poisonous for either aerobes or anaerobes. Experiments on this point are being carried on, notably at Manchester, Bradford, and Leeds; while a "septic" installation at Yeovil, which deals with 200,000 gallons a day, is said to have operated successfully since 1896 on a strong sewage rendered especially difficult to deal with on account of the presence therein, in large quantities, of leather-dressing products.

While, however, economics, pathogenic fears, and manufacturing refuse remain, so far as sewage is concerned, "on the knees of the gods," agriculturists will be interested in the glimpse which Mr. Scott-Moncrieff vouchsafes them of a nitrate-producing region, less remote than South America and more accessible, it may be hoped, than Professor Crookes' nitrogen-store.

Meanwhile, there remain the isolated homes of country gentlemen and farmers, for whom the biolysis of sewage offers a tried, cheap, and complete issue out of afflictions which, in some cases, and on some soils, are serious enough. A pit full of stones and a coke filter are all the apparatus required to permit the drainage of a great country house being harmlessly thrown into a stream, or a piece of ornamental water; or, if Scott-Moncrieff's nitrifying chamber be adopted, utilised with advantage in the greenhouse and conservatory.

Mr. Dibdin, Mr. Scott-Moncrieff, Mr. Cameron, and Dr. Vivian Poore, each occupying a camp of his own, represent the practical champions of the Bacterial Treatment of Sewage; and if no mention has been hitherto made of the last gentleman, that is because his "dry" method of dealing with excreta has been already declared outside the scope of this article, which, for reasons adduced, deals with water-borne sewage only. No loss to the reader will thus accrue, since Dr. Poore has set forth his own case so often, so well, and, in his little book entitled "The Dwelling-house," so charmingly, that the writer's silence may well be forgiven.

But apart from these practical pioneers, a number of distinguished bacteriologists and chemists have paid, and are increasingly paying, great attention to the various problems—none of which are yet completely thrashed out—that arise in connection with the subject of this review. Among them, Drs. Sims Woodhead, Rideal, Kenwood, Butler, and Houston, together with Messrs. Kaye Parry, Adeney, Pearmain and Moore are conspicuous, and it is a matter of regret that their brilliant work cannot be formulated in terms sufficiently untechnical for employment in a popular exposition such as this essay. It must suffice to say that, while differing upon matters of detail, these scientists all agree that future plans for the disposal of sewage must consist, first, in artificially hastening the natural process of putrefaction, and afterwards in oxidising, for the purpose of rendering inoffensive, and possibly valuable, the products of such putrefaction—the functions respectively of Pasteur's anaerobes and aerobes.

DAN. PIDGEON.

The Long House, Leatherhead.

FLOWER AND FRUIT FARMING IN ENGLAND.

IV.

FRUIT GROWING UNDER GLASS.

RAPID EXPANSION OF THE HOT-HOUSE INDUSTRY.

No other industry connected with land has shown such great expansion in this country during the last thirty years, and especially during the last twenty, as the cultivation of fruit and

flowers under glass for market. Some statements by nurserymen as to the increase of glass-houses in particular districts have already appeared in the portion of my report[1] relating to hot-house flowers, and others will be given in this section. Thirty years ago only one nurseryman in Cheshunt, Herts, had a hot-house, and now there are at least 125 acres covered with glass in that parish, not including outside borders or roadways; while in neighbouring parishes also there has been a similar increase. Four brothers in the district have at least 90 acres covered with glass, and it is only seventeen years since they started. A little over thirty years ago there was only one glass-house in Ponder's End, near Cheshunt, and the increase is said by one nurseryman to be a thousandfold in and near that parish. Similarly at Enfield, Tottenham, and other places in the neighbourhood there are numerous glass-house nurseries, nearly all of which have been established within thirty years, and the great majority within twenty. Even in Edmonton, where the industry appears to have started as soon as it was considerably developed anywhere, it is said to have increased tenfold within the period under notice. In Finchley, where one nurseryman has 19½ acres covered, he started only twenty-one years ago, and there was no glass worth mentioning in his neighbourhood then, whereas there is a great expanse besides his own now. Similarly in Whetstone (where the only nursery has grown from a small to a large one), the Thames valley, Mitcham, and, other districts around London, the hot-house industry has expanded from an insignificant undertaking to a vast business.

Turning to Worthing, in Sussex, it appears that less than one acre was covered with glass twenty-four years ago, and now in that district there are at least 50 acres covered. In Swanley, Erith, Belvedere, Bexley Heath, and other parts of Kent, again, the expansion has been remarkable; and the great majority of the more scattered glass-house nurseries of the provinces generally have been either started or greatly expanded within twenty years.

From the evidence collected it seems safe to assert that there were not 100 acres in all England covered with commercial hot-houses thirty years ago; whereas now I estimate the total at fully 1,100 acres. Mr. Alex. James Monro, manager of the Nurserymen's, Market Gardeners', and General Hailstorm

---

[1] The first two sections of this report, dealing with Flower Farming, were published in the Journal last year (3rd Series, Vol. IX., 1898) at p. 286 (in Part II.) and p. 512 (in Part III.). The third section, dealing with Fruit Growing in the Open, appeared in this volume (Part I.), p. 30.—ED.

Insurance Corporation, obliged me with the extent of glass insured in his office up to the middle of last October, which was 25,108,197 sq. ft. This extent, according to good authorities, is probably less than half the commercial glass-house expanse in England, and, as it has become greater since October,[1] it appears to me a moderate estimate to put the total at 60,000,000 sq. ft. I am informed that one-fifth should be deducted as an average allowance for the difference between the superficial area of roofs of different spans and that of the ground covered; and, according to this calculation, the area of land actually covered is about 1,100 acres. Of course the area of hot-house nurseries, including borders to some houses, roadways, and open space necessary for renewal of soil and other purposes, is very much greater than the space actually covered with glass. Moreover, it is to be borne in mind that the thousands of noblemen's and gentlemen's hot-houses are not included, although fruit is sold from very many of them at times.

The figures convey but a faint idea of the immensity of the business carried on in glass-houses. A nursery in which there are 4 acres completely covered presents an imposing appearance, and makes a considerable business. Perhaps a more adequate idea of the extent covered with glass than is conveyed by the statement of the acreage may be obtained by imagining over 600 miles of hot-houses 15 ft. wide. As many houses are much wider, the whole as estimated above, if placed end to end, would not extend to that distance; but, as an illustration of the extent of commercial hot-houses in the country, this calculation will serve.

There are no data for an estimate of the proportions of hot-house space devoted to fruit, flowers, and vegetables respectively. But, as an immense space is mainly used for grapes, and vegetables are not at all largely grown under glass in this country, if cucumbers as well as tomatoes[2] be classed as fruit, as both are botanically, there is no doubt that a greatly preponderating proportion is devoted to fruit as their chief object, though flowers are forced in a large number of fruit-houses during the winter and early spring, as well as in many devoted entirely to them.

[1] At the beginning of May last it was over 26,000,000 sq. ft.

[2] It may be explained here that the tomato in this report will be treated as a fruit, although most horticultural authorities class it with vegetables. It is used both as a fruit and as a vegetable, being made into preserves and, in its choice varieties, eaten as a fruit, as well as being consumed as a culinary vegetable and as salad. The cucumber, on the other hand, is used exclusively as a vegetable; but, as it is a very important product of hot-houses, its right from a botanical point of view to be classed as a fruit may be accepted as an excuse for noticing its culture in a report on fruit-growing.

Similarly there are no means of estimating with any approach to precision the quantities of fruit produced under glass in the country. Mr. Assbee, Superintendent of Covent Garden Market, in a paper contributed early in 1898 to the *Journal of the Royal Horticultural Society*, stated that, although he could not give accurate information upon the point, so far as he could judge, about 1,000 tons (2,240,000 lb.) of grapes, 6,000 tons (13,440,000 lb.) of tomatoes, and 500,000 dozens of cucumbers were produced annually in the United Kingdom.

These estimates appear to me to be very much within the mark, as I have good reason to believe that, in a fairly productive season, three large growers within twenty miles of London, together produce at least 220 tons of grapes, 550 tons of tomatoes, and 150,000 dozens of cucumbers. Within that district six growers might be selected whose aggregate production of grapes can hardly be less than 340 tons, and there are many more who grow from 10 to 20 tons each. Then in the Worthing district, one grower, who takes the coast line from Southwick, near Shoreham, to Littlehampton, about thirty miles, into his calculation, estimates the annual production of grapes at 500 tons. This is much more than I should have put the quantity; but my informant, who knows the district well, stands by his estimate, and says that it is equivalent to barely one ton per vinery. Then the contribution of the Swanley district is a large one, and there is also the production in scattered nurseries all over the country to allow for. In the case of tomatoes, six growers might be named whose aggregate production I estimate at fully 1,000 tons; and one very extensive grower of cucumbers at Worthing gave me figures representing his production as about 90,000 dozens.

Mr. Assbee's estimate of the extent of glass in the United Kingdom was 32,000,000 sq. ft.; but this is obviously by far too little, as I have stated that over 26,000,000 square feet were insured in one office last May, and have given reasons for putting the total for England and Wales at 60,000,000 sq. ft., which, allowing for the pitch of roofs, are equivalent to about 1,100 acres of land covered. The difference between the totals for the kingdom and for England and Wales alone would not be very large, as there is not a great extent of commercial glass-houses in Scotland, while there is an extremely small one in Ireland. However, without going into calculation upon this point, it may be pointed out that if Mr. Assbee's estimates of production were raised in proportion to the difference between 32,000,000 and 60,000,000 sq. ft., they would be brought up to over 1,800 tons of grapes, 11,000 tons of tomatoes, and 937,000

dozens of cucumbers. Judging from quantities grown by several nurserymen, these figures represent the proportions of grapes and tomatoes as too far apart, and I should considerably increase the former, and reduce the latter.

It must be admitted that no estimates of the quantities of products under glass can be much better than rough guesses; but estimates of actual production of grapes and tomatoes in houses of given size might afford a basis for approximate reckonings, if the proportions of space devoted to different products could be determined. Unfortunately, these proportions are not known, and I can do no more than show the quantities of grapes and tomatoes that may be accepted as rough estimates, on the assumption that certain proportions of the glass-house area are devoted to them respectively. If, from the 1,100 acres of land covered with glass, 350 acres be deducted for flowers, 750 acres remain for fruit and cucumbers. Bearing in mind the fact that very large quantities of flowers are raised during the winter and early spring in fruit-houses, I think that 350 acres are amply sufficient to allow for flowers alone. Of the 750 acres left, 350 acres may be allotted to grapes, 250 acres to tomatoes, 110 acres to cucumbers, and 50 acres to stone fruit, strawberries, and other produce. It must be borne in mind, however, that the areas allowed to these products overlap each other, as tomatoes are grown in both grape and cucumber houses to a large extent; also after strawberries.

Supposing that grapes are grown on 350 acres, let us see what a reasonable estimate of yield per acre will make the total amount to. One grower states that he has actually produced two tons of grapes in a house 160 ft. by 28 ft., or at the rate of 19 tons 8 cwt. 104 lb. per acre. This was the greatest crop he ever grew, and his usual production in the same house is from $1\frac{1}{4}$ to $1\frac{1}{2}$ tons, equivalent to from 12 tons 3 cwt. to nearly 14 tons $11\frac{3}{4}$ cwt. per acre. As this vinery is commonly crowded with flowers, to the detriment of the vines, these ordinary quantities are probably exceeded by many growers, and 14 tons per acre would appear to be no more than an average crop for a vinery in full bearing. Another grower last year produced on vines which reached only about half-way up the roof 23 cwt. of grapes in a house 160 ft. by 21 ft., equivalent to 14 tons 18 cwt. per acre, a great crop for young vines. A very extensive grower obtained of Gros Colmars, the heaviest cropping grapes, 7,800 lb. from houses measuring 526 ft. by 21 ft., equivalent to 13 tons 14 cwt. 71 lb. per acre. A good crop of Alicantes, in a house 168 ft. by 22 ft., weighed 2,900 lb., or at the rate of $15\frac{1}{4}$ tons per acre. A small grower produced last season 670 lb. of Gros

Colmars in a house 50 ft. by 16½ ft., or at the rate of 15 tons 15 cwt. 86 lb. per acre. Lastly may be mentioned the production of 7 tons in a house covering a little less than one-third of an acre on one occasion, a phenomenal crop equivalent to over 21 tons per acre. Last season, in the same house, 5 tons, or 15⅛ tons per acre, were expected.

All these weights are those of either the Gros Colmar or the Alicante variety, the greatest croppers among the grapes commonly grown in this country. Muscats or Black Hamburghs would yield less, and when forced for very early crops, the rate of production of Black Hamburghs might be but little more than half the yield of an average crop of late Gros Colmars.

Some very extravagant estimates of the yield of vines have been published, based on assumed average weights per bunch and a given number of bunches per rod (usually one bunch to the foot); but such calculations are very misleading. Judging from such statements of actual production as are given above, corroborated by less precise evidence from growers, I put 14 tons per acre as an average yield for vines in full bearing. Then, making a liberal allowance for the proportion of young and failing vines, I take 12 tons per acre as the average production of the estimated area of 350 acres under vines, making a total of 4,200 tons.

In houses devoted entirely to tomatoes, two crops, and occasionally three, are grown in a year; and, as already stated, they are also produced extensively in vineries and cucumber houses. It appears a moderate allowance, therefore, to assume that one crop in a year is grown on at least 500 acres. Estimates of the yield of tomatoes vary greatly. One grower has obtained, in a house 160 ft. by 28 ft., 3 tons as a fair crop and 4 tons as a great crop, equivalent to from 29 to nearly 39 tons per acre. These quantities may appear large; but an easy calculation will show that they are not impossible. There are 43,560 sq. ft. in an acre, and deducting one-seventh for pathways, the area to be devoted to plants would be 37,337 sq. ft. Now, 3 lb. per plant would be a poor crop, and 6 lb. a great one, as the plants are usually grown in large houses: that is, to produce only four trusses of fruit each. It must be explained that when tomatoes are grown in pots, or otherwise when a second crop is to be produced in the same season in the borders of a house, it is usual to stop the plants when they have set four trusses of fruit. In such cases 3 lb. per plant would be a poor first crop, and 5 lb. a good one. But when only one crop in a season is grown, the plants being allowed to run up to the roof of the house, 6 lb. per plant, or

even more as a great crop, may be produced. Plants are often set in hot-houses $1\frac{1}{2}$ ft. apart each way, and at this distance there would be 16,593 plants to the acre. In most cases in wide houses, however, there are short paths at intervals at right angles to the main path, to enable workmen to get about among the plants, and to allow air to circulate freely among them. Frequently the plants are set 2 ft. by $1\frac{1}{2}$ ft. apart, in which case there are 12,446 plants to the acre. I propose, then, to take the latter number in estimating the average yield. At 3 lb. per plant the produce per acre would be a little over $16\frac{1}{2}$ tons; at 4 lb. per plant, about $22\frac{1}{4}$ tons; at 5 lb. per plant, $27\frac{3}{4}$ tons; and at 6 lb. per plant over 33 tons. Information obtained for me by Mr. John Wright, editor of the *Journal of Horticulture*, from a grower who bases his estimate upon six years' experience with at least a million plants, is to the effect that a first crop in a season is from 20 to 25 tons per acre, and a second crop from 10 to 12 tons. Other growers do not reckon upon so great a reduction in the produce of the second crop, when it is properly managed, and I have seen many examples in which the yield could not well be less than 3 lb. per plant, and some in which it was estimated at 4 lb.

Mr. W. Neild, who has charge of the hot-houses at the Agricultural and Horticultural School, Holmes Chapel, has favoured me with details of the produce of two small houses, each 40 ft. by 12 ft. Only two rows of plants were grown in each border, or four rows in each house, the plants being 1 ft. apart in the rows. The plants, however, were trained up wires in single stems to the apex of each roof, about 8 ft. The number of plants in the two houses was only 232, and yet they yielded 1,700 lb. of fruit, or 7 lb. $5\frac{1}{4}$ oz. per plant, or at the rate of nearly $34\frac{1}{2}$ tons per acre. In this case the apparent loss of space was fully made good by the height to which each plant could be trained, owing to there being only two rows in each border. Details of a yield much greater than this, on land fresh to tomatoes, were given to me by a large grower; but it was quite phenomenal.

With such examples as are given above in view, an estimate of 20 tons per acre as an average crop of tomatoes must be considered moderate, and yet this yield on 500 acres would make a total of 10,000 tons as the annual crop grown under glass in England and Wales, no account being taken of open-air produce.

Reduced to pounds, which are more suitable denominations than tons for such products as grapes and tomatoes, my estimates, which I believe to be well within the mark, are 9,408,000 lb. of grapes and 22,400,000 lb. of tomatoes. The

quantity of tomatoes is a subject for astonishment when the shortness of the period during which they have been grown commercially in this country is considered. In *Thompson's Gardener's Assistant*, published in 1859, it was stated that "the tomato is very rarely forced in this country."

The total of cucumbers I cannot venture to estimate, as the yield varies extremely, and such information as has been supplied by growers is not sufficiently definite. Similarly there are no data for estimates of peaches, nectarines, strawberries, figs, or other kinds of hot-house produce not named above.

Hot-houses near London.

The most important of the Metropolitan districts in relation to hot-house fruit production are those situated north of London, and the notes of visits to some of the largest glass-house nurseries could not begin more appropriately than with those relating to the great undertaking founded and carried on by Mr. Peter Kay, at Finchley. Mr. Kay has long been noted as one of the best grape-growers in the country, his success with the Canon Hall variety, a difficult one to grow to perfection, being unequalled. He is among the sixty men honoured by the Royal Horticultural Society with one of the Victorian gold medals, struck in the Jubilee year by permission of the Queen, and awarded for eminent services rendered to horticulture.

Mr. Peter Kay started his business twenty-five years ago with 50,000 sq. ft. of glass, and now he has 850,000 sq. ft., equivalent to over 19½ acres of land actually covered. The structures are heated by piping 27 miles in length. Nearly one-fourth of the expanse of glass was put up in 1898, and the new houses were not finished until the end of the autumn. There are 82 boilers to generate heat. The running length of the houses, from 14 ft. to 36 ft. wide, is now about 30,000 running feet, or nearly 5¾ miles. The space occupied by the nursery (or vineyard, as its owner prefers to call it) is 34 acres, a little over half the land owned by Mr. Kay in Finchley. An enormous rain-water reservoir, over 2¼ acres in extent, has recently been completed. It will hold fifteen million gallons, and will supply the whole nursery, in which twelve million gallons per annum of waterworks supply have been used previously, at a cost of 600*l*. The water is now pumped up to a tower, whence it flows to all parts of the nursery. From seventy to eighty men have usually been employed, and the number will shortly be much greater, as only about half the hot-houses had been in full profit up to the end of last year. Wages run from 15*s*. to 25*s*.

a week. The sum of 50,000*l.* has been spent on glass-houses alone.

Mr. Kay grew about 75 tons of grapes and 100 tons of tomatoes in 1898, and he expects to grow 150 tons of grapes in two or three years, as many new vineries are now coming into full profit, and the increase in production is already about 50,000 lb. a year. Fifteen hundred new vines were planted in 1897. Cucumbers also are grown somewhat extensively, three crops per annum being raised in the houses devoted to them. The production is about 18,000 dozens in the season. These are the only products of the hot-houses, no flowers being grown, even in the winter.

My inspection of the houses began with that of twelve vineries 400 ft. long, 36 ft. wide, and 15 ft. to 16 ft. high, with a transept in the middle of each house. These great structures, which good judges have declared the finest block of vineries in the world, occupy 7 acres of land, including their outside borders and roadways. It is worth notice that, in constructing his new vineries, Mr. Kay is giving up the system of outside borders with which he started. One reason is that the land is too valuable (it sells at 500*l.* to 750*l.* per acre in this district) to allow of the devoting of unnecessary space to the vines. But this is not all, for there are disadvantages attached to outside borders, especially where the climate is bleak, and the soil heavy. For example, the roots in the outside border are dormant long after those inside the house have become active, and, more important still, long after the vines have begun to make growth under the influence of heat, so that only about half the roots are at work to keep pace with the development of the vines. Again, an excess of water causes young grapes to mildew, and ripened fruit to split, and the quantity of water that falls on outside borders is not under control. On the other hand, drought also is injurious to outside borders.

The upright system of growing vines, for which there was a fancy some years ago, was tried in the Finchley vineyard, and given up, as it has been by all commercial growers who have tried it. The grapes do not ripen properly on the lower portions of vines so grown.

Mr. Kay is an advocate of the extension system in relation to vines, believing that the vigour and life of a vine are in proportion to the expansion of its foliage exposed to the light, though for speedy fruiting after planting that system is not to be recommended. As a rule, he grows 2 rods to each vine, 2 ft. apart; but where there is space, as in the transepts of his large houses, he has a few vines with from 8 to 20 rods

each. The Canon Hall variety has 3 to 7 rods to the vine. One vine, with 8 rods, has produced 200 lb. of grapes. As to varieties, Gros Colmar occupies about four-sevenths of the space devoted to grapes; Alicante two-sevenths, and Canon Hall one-seventh. I inspected the vineries twice in the season—in the spring, and in the autumn—and in the latter period especially, they presented a beautiful appearance, with the bunches of grapes hanging thickly, and in most cases as regularly as if each bunch had been placed exactly where it was wanted. In one house, 400 ft. by 36 ft., there were 10,000 bunches. Either in that house or in another of the same size, 5 tons of Alicantes were expected, and 7 tons have been grown in one of these dimensions. In other houses splendid crops of Canon Hall Muscats excited admiration. The vines of this variety are difficult to raise, and the fruit is shy in setting; but, as already stated, Mr. Kay has been uniquely successful with it. He has grown 10,000 lb. of it in a year, and has now enough vines of that variety to produce 20,000 lb. in a good season.

The commercial life of a vine is estimated by Mr. Kay at 20 years, and at the end of that period it is "tired" of its situation. Moreover Mr. Kay says that the profitableness of a vine begins to deteriorate after the tenth year. Yet he showed me houses in which vines had been cropped for 17 to 20 years, and the growing crops were excellent. Generally, after so long a time of cropping, very poor results are to be expected in some seasons, he said.

The neighbourhood of London is not propitious, either in relation to climate or soil, to the production of very early grapes, and Mr. Kay does not attempt to ripen any till the early part of July, when he has some of the Canon Hall variety ripe, while a portion of the crop of that sort is kept back till February, and some Alicantes and Gros Colmars till the middle of April. Fresh soil is carted for the top-dressing of vine borders every two or three years. The soil of the nursery is a stiff loam on the London clay. For choice in starting a nursery, Mr. Kay would prefer old turf on a good loam, with a brick-earth subsoil. A gravel subsoil is not objectionable, if it has a thick covering of loam; but a solid chalk subsoil is not desirable, at any rate if it comes near the surface.

In visiting nurseries, I have noticed that the hot-houses run in various directions, as if there were no choice as to aspect. Mr. Kay says, as I should have expected, that it is well to make them run north and south, so that the sun shines equally on both sides of the roofs. His houses, however, as a rule run from north-east to south-west. Many nurserymen appear to

think that the direction in which houses are placed is of no great consequence, except for very early grapes, which must have a south aspect, and are usually grown in lean-to vineries.

A great many houses are devoted to tomatoes, two crops being grown in the year. Eighty-five thousand plants were growing in pots last spring, and a large number in the borders of new houses. The varieties are Queen of the Earlies, to come in first; Comet, for the main crop; and Stirling Castle as the late variety. The first is to some extent wrinkled; but it is of good flavour, and a great cropper. The picking of early tomatoes began this season in the first week of May, when the price was 1*s.* a pound. Last year, by the beginning of June, the price had fallen to 7*d.*, and late in the season tomatoes became extremely cheap, English hot-house tomatoes being quoted at 3*d.* to 5*d.*, while some of inferior quality were sold at 2*d.*, and, indeed, for a week or two, at a penny or less. Mr. Kay produces them up to Christmas. He had some fine crops last season.

Cucumbers are marketed from February to September, three crops, as already stated, being grown in the year. If produced in January, as at Worthing, they sell sometimes at 12*s.* a dozen, but were worth no more than 2*s.* 6*d.* at the beginning of June, a low price also reached this year in April as the bottom rate. Mr. Kay grows some very fine crops, but does not care to increase his production of cucumbers, as they are too cheap.

Farmyard manure or London dung is the principal fertiliser used in the nursery, bone-meal being the chief artificial manure applied to vines, while potash also does good.

With respect to the commercial aspect of the hot-house industry, although he gave instances of wonderful returns, such as 1,600*l.* from one house (nearly one-third of an acre in extent) of Canon Hall grapes, Mr. Kay speaks in somewhat disparaging terms. Expenses are enormous, and depreciation comes very quickly, though it is too commonly ignored by men who enter the business. Indeed, Mr. Kay declares that, in his opinion, the industry does not average a profit of 10 per cent. on the capital embarked in it in the country at large. His net profit from a nursery containing over 600,000 square feet of glass (before the recent extension), he says, is no greater than it was when he had only 70,000 square feet, in consequence of the great fall in prices. Grapes, he adds, are worth only about one-third of the prices current ten years ago. In the past he has sold 50 lb. of grapes for 50*l.* in March; whereas, of late, the price has rarely reached 6*s.* He has sold 10,000 lb. of grapes at 1*s.* a pound; no doubt, in the autumn. The general average he puts at 1*s.* 10*d.* a pound, and the fruit must be well

grown to reach that average. The range of prices is put at 1*s.* to 6*s.* a pound. Very early grapes sell at high prices, and 6*s.* would not be the maximum for them; but they are obtained only at a great expense, and the yield is much smaller than that of comparatively late grapes. To give a man any chance of success in the hot-house business, a thoroughly practical training is necessary, and without it capital is almost certain to be lost.

It is a curious fact that throughout the 25 years of his business career, Mr. Kay has sent the whole of his produce to one salesman, Mr. George Monro, of Covent Garden.

The fine nursery belonging to Mr. J. Sweet, of Whetstone, has already been referred to in relation to flowers; but it is one of the best also for fruit. There are 29½ acres altogether, some 20 acres being covered with glass. About 100 men are employed in the summer. Mr. Sweet has been at Whetstone thirteen years, having first started in business at Leyton, Essex, in 1862. It is worth while to notice, as indicative of difference of opinion among grape-growers, that, whereas Mr. Kay is not pursuing his old system of providing outside borders in the erection of new houses, Mr. Sweet has adopted it in connection with his remarkably fine new structures. The new vineries at Whetstone have wide borders inside and outside, some of the houses being 40 ft. wide. These vineries are 250 ft. long, and cover nearly a quarter ($\frac{7}{30}$) of an acre each. Mr. Sweet believes that vines last ten years longer under the old system of wide borders inside and outside than under the new method of making ranges of houses with only inside borders, and that the grapes grown under the former system are finer than those which are produced under the latter. It is noticeable that nearly all the rain water which runs off the houses in the nursery is collected in tanks inside the houses.

Mr. Sweet grows Gros Colmar grapes most extensively, but fairly large quantities of Alicantes and Hamburghs, and one house of the Madresfield Court. The variety named first is the best keeping sort, though Alicantes also keep well when grown on some soils. "Gros Colmar" or "Gros Colman" is a corruption of Grosse Kölner; but the original name is never used among nurserymen. Mr. Sweet declined to state the quantity of grapes produced in his nursery in a year; but I believe it is at least 40 tons, and that it will soon be over 60 tons. He begins to cut Hamburghs in May, and has late grapes up to the end of March, or possibly up to April. Muscats have been tried in the nursery, but have been given up, because they did not flourish, the soil being too heavy for them, as it is a stiff loam over the

London clay. There was a fine show of Hamburgh and Madresfield Court grapes in the first week of June, last year, when my visit was made, and later crops were highly promising. It is clear that grapes are admirably grown in this nursery. As a rule, there are two rods to each vine.

Some of the best crops of tomatoes seen anywhere last season were found in the Whetstone nursery. The Comet is the variety most extensively grown, the Trophy being cultivated to a small extent. The plan of sulphuring the hot-water pipes where tomatoes are planted, as a preventive to disease, is adopted; and either for this or some other reason, the plants in all the houses were exceptionally robust and healthy last season. Mr. Sweet regards it as dangerous to spray plants with the Bordeaux mixture after the fruit has set. As a striking illustration of the growth in the consumption of tomatoes, Mr. Sweet stated that in 1862 he knew only one grower of the fruit for market, and although that man's production was only one ton per annum, it was too much for the London market.

There are only two cucumber houses in the nursery; for, notwithstanding that Mr. Sweet believes that cucumbers pay better than tomatoes, the cultivation of the former is "killing work for men."

With respect to the financial prospects of the hot-house industry, Mr. Sweet's views are somewhat depressing. He says he has had more apprentices than anyone else in the business, and the majority of the young men have given up the industry after making a start in it. Profits, it is said, are now so small that a great return is necessary to produce a good income, and this is one reason for the great extensions in glass-houses now being made. It is obvious, however, that this method of increasing returns will tend still further to diminish profits in the long run. Another nurseryman, it may be mentioned in this connection, says that there is no chance now for any but very extensive producers, and small producers who do a large portion of their own work. Like Mr. Kay, Mr. Sweet can remember selling grapes (fine Muscats) at 20*s.* a pound, whereas now they are rarely above 6*s.* when at the dearest, though extra fine Muscats sometimes sell up to 10*s.* very early in the season. Again, Hamburghs, at the end of the first week of June, last year, were selling at 2*s.* 6*d.* per pound. or even less, the average being only about 2*s.*

Owing to France having raised her duty on grapes, Mr. Sweet says, large supplies of Belgian grapes have lately been thrown on the London market, especially late fruit, in supply from October to March. Last year, for instance, Belgian hot-

house grapes were selling in London during March at 3*s*. 6*d*. to 4*s*. per pound, but this year they have been sold at half those prices, telling seriously upon the trade in home produce, kept through the winter on the vines at considerable expense, and wasting greatly in weight.

If we may judge from one amusing example, the confidence of Belgian grape-growers in their ability to beat English nurserymen in English markets is superb. A young Belgian, visiting the Whetstone nursery, had the assurance to ask the proprietor when Englishmen would give up growing grapes for market. On being asked what grounds he had for supposing that he and his fellow countrymen could beat their English rivals, he said that labour was much cheaper in Belgium than in England, and that, in the former country, children were employed to thin grapes. It may be added that the Belgian system of heating houses with flues is cheaper than heating with hot-water pipes, but that it is not nearly as safe or satisfactory in results.

Turning to Edmonton, there is again occasion to notice Mr. H. B. May's nurseries, one of which is mainly devoted to fruit. He produces up to 9 tons of grapes and 22 tons of tomatoes in a year in the smallest of his three nurseries, the others being entirely devoted to flowers and foliage plants. In a house 160 ft. by 28 ft. he has grown 2 tons of grapes, or at the rate of 19 tons 9 cwt. per acre. This was the largest crop he ever grew, an ordinary one being from $1\frac{1}{4}$ to $1\frac{1}{2}$ tons in a house of the size given, or at the rates of 12 tons 3 cwt. to 14 tons $11\frac{3}{4}$ cwt. per acre. Four tons of tomatoes in one crop were once grown in a house of the same size, or at the rate of over $38\frac{3}{4}$ tons per acre. Three tons are reckoned a fair crop, equivalent to 29 tons per acre. Last season the best crop of grapes was $1\frac{1}{2}$ tons in a house 160 ft. by 28 ft.

Mr. May has fourteen vineries, thirteen being planted, but only six in full bearing up to last season. The Gros Colmar, Alicante, and Muscat of Alexandria are the varieties grown. Mr. Somers, the excellent manager of the particular nursery under notice, is strongly opposed to outside borders for vines. Two rods to the vine are grown, and they come into bearing in the third year after planting. No attempt is made to produce very early grapes, but a fair portion of the late crop is kept until January or later.

Tomatoes are grown in the grape-houses until the vines cover the glass, being set in the borders for the first three years, and afterwards in pots. In the first year after planting vines, tomatoes are grown all over the inside of the vinery, except

where there is a pathway; in the second season, in the inner portion of the space only; and in the third, merely along the middle of the house. In the fourth year the house is devoted to the vines alone, except when flowers are wintered in it. The distances between tomato plants in the borders have been $1\frac{1}{2}$ ft. each way; but in future it is intended to allow 2 ft. by $1\frac{1}{2}$ ft. In pots the plants are only about 1 ft. apart each way. Chemin is the single variety grown. The fruit is marketed from some time in May up to September. No cucumbers are produced for market in the nursery.

As to finances, Mr. May says that prices for grapes and tomatoes have fallen fully one-half on the average during the last six years. About so long ago he sold grapes in January at 6*s*., 7*s*., and occasionally 10*s*. 6*d*. per pound, and in January, 1898, he was getting only 2*s*. 6*d*., the highest market quotation being but 3*s*. at the end of the month. In the autumn lower prices are expected, of course; but at the end of last November they were low beyond precedent, I believe, as English hot-house grapes of the ordinary kinds (Colmars and Alicantes) were quoted at 10*d*. to 1*s*. 6*d*. per pound, and Channel Islands grapes down to 4*d*. Similarly, about six years ago, Mr. May averaged 6*d*. a pound for his tomatoes, but only 3*d*. in 1897, when there was a great production. As he produces tomatoes only in the season when they are abundant, and neither early nor late fruit, his average must be lower than that of some other growers. But even at the end of last November, a period of the season when tomatoes used to sell at 10*d*. to 1*s*. per pound, English fruit was selling at 3*d*. to 5*d*. in the wholesale market. Supplies from the Canary Islands have helped to spoil the late autumn trade in tomatoes; but the vast increase in the home supply is mainly the cause of the fall in the average price. No wonder then that Mr. May is of opinion that the hot-house industry is extending too rapidly.

Edmonton is a very large parish, and there are many nurseries scattered over it. Mr. May has 10 acres of land actually covered with glass, and he estimates the total for the parish at about 100 acres.

Other parishes to the north of London, more distant than Edmonton, will be referred to in connection with the Cheshunt district. Now I must pass on to the Thames Valley, following the course of my itinerary in that Metropolitan district, and once more calling attention to the enterprise of Mr. James Walker, of Ham Common, whose outdoor flower and fruit grounds have already been noticed.

Finding, when he commenced business, that nearly all

nurserymen were going in for grapes and tomatoes, Mr. Walker decided to devote his attention to peaches and nectarines, and these fruits he grows in rare perfection in a fine range of eight substantial hot-houses, each 180 ft. by 24 ft., and two of 100 ft. by 24 ft., while at least two of four smaller houses are now planted with fruit of these kinds. There are several of the best of the old varieties, and two houses have been planted with the new Early Rivers and Cardinal nectarines. The trees in all the houses are wonderfully robust and well trained, the older ones completely covering the glass, except where standard peaches are grown in the ground or in pots along the middle of the houses; and the fruit thickly sprinkled over the trees presented a beautiful appearance in each of the last two seasons. Peaches and nectarines are gathered from the third week in May until the first week in September. The large houses are now eleven years old, and the trees have been bearing nine years.

The chief enemies of peaches and nectarines are red spider and black aphis; but the former cannot withstand moist heat. The prices of these fruits have not altered materially since Mr. Walker began to grow them for market on an extensive scale. A large quantity of rhubarb is forced in the winter.

There are many hot-house nurseries in Hampton, in some of which grapes, tomatoes, cucumbers, and French beans are grown; but this district will be referred to in connection with the forced strawberry division of the industry.

Passing on to Whitton, near Hounslow, Mr. B. Matthews was visited in reference to fruit as well as flowers, though the latter occupy most of his hot-houses. Here I found tomatoes growing in some of the cucumber houses, and, although the cucumbers, trained over the glass inside the houses, shade the tomatoes, the fruit of the latter was colouring well on April 29, when picking began. The seed for the tomatoes was sown in the preceding November. The variety was the Comet. A second crop of cucumbers is usually grown in the same houses in the season. According to Mr. Matthews, cucumbers still pay well where they flourish. He takes a hopeful view of the hot-house industry; for although he says that prices are 50 to 70 per cent. lower than they were some years ago, all the produce grown can now be sold, whereas gluts were frequent when prices were high. By producing on an extensive scale, therefore, large net profits are to be obtained.

Messrs. Mizzen Brothers, of Mitcham, I believe, are among the two or three most extensive producers of cucumbers in the country. In their considerable expanse of hot-houses they often

cut over twenty tons in a week. In some houses cucumbers are grown after forced mushrooms, which, as well as outdoor fungi, are produced on a very large scale. At the beginning of May, 1898, cucumbers were selling at no more than 1*s.* 6*d.* to 3*s.* a dozen, and they had been as cheap, I was informed, before Easter. They are marketed from the Mitcham nursery from the first week in March till the end of August. Tomatoes are grown in the same houses as cucumbers. In some cases tomatoes were raised from cuttings. No grapes are produced in the nursery. Rhubarb is forced on a considerable scale.

Thirty-two years ago, when Mr. Mizzen, senr., settled in Mitcham, there were no hot-houses for market purposes in the parish; now, according to Mr. Alfred Mizzen, about fifty acres are covered with glass. The estimate struck me as too high, and possibly outside borders or roadways are included; but there are several small hot-house nurseries, and probably I did not see them all. Like Messrs. Mizzen's nursery, they are devoted more to flowers than to fruit, though cucumbers are very extensively grown in some of them.

The Cheshunt District.

In noticing the most important hot-house district to the north of London, from Tottenham, in Middlesex, to Stansted in Essex, it is proper to take Cheshunt first, not only because that large parish is the most important centre, but also because it contains the greatest glass-house nursery in the world. In this nursery, which belongs to Mr. Joseph Rochford, there were no less than 27 acres actually covered with glass at the time of my visit, in the first week of May, 1898, and the area has been extended since.

When Mr. Rochford started, seventeen years ago, only one man had a little glass in Cheshunt, and in 1898 he estimated that 125 acres were covered with it. Waltham Cross is in Cheshunt parish, and is covered by the estimate which seemed to me a very moderate one at the time, and probably is too small now, at any rate. Mr. Joseph Rochford and his brother Thomas together had 51 acres covered at the time of my visit, and there are many other nurseries, large and small, in the parish.

The soil of Mr. Joseph Rochford's nursery is a deep loam over gravel, and grapes, tomatoes, and cucumbers, his only products, alike appear to flourish in it. From 9,000 to 10,000 cartloads of earth have to be shifted annually, to change the soil of borders and pots.

It was extremely difficult to induce Mr. Rochford to give

any figures in relation to his vast undertaking, as he declared himself strongly averse to the "spread-eagle" style of notices of great nurseries which have sometimes appeared, going so far as to say that he saw no necessity for even his name being mentioned. Most emphatically he declined to give any statistics of his production. But there were 12 acres under vines on the occasion of my visit, a large proportion being in full bearing, and more have since arrived at that stage. On this area I estimate the annual production at fully 140 tons (313,600 lb.) of grapes. Considerably more space, I was informed, was devoted to tomatoes, including that of young vineries, and 16 acres may be taken as a fair estimate. On a large portion of this area two crops would be grown in the year, and remarkably well grown too; therefore it seems well within the mark to allow 25 tons per acre (including the produce of the second crop), and to put the total annual production at 400 tons, or 896,000 lb. As an indication that this estimate is within the mark, it may be stated that 200,000 plants, mostly in pots, were growing at the time of my visit, and that 3½ lb. per plant would make 700,000 lb. for the first crop. Supposing that only 100,000 plants are grown for the second crop, producing 3 lb. per plant, the total produce of the year would be brought up to 1,000,000 lb. There are no data for computing the production of cucumbers.

The number of men employed in the nursery was not stated; but it must be very large. Labourers get 21*s.* a week, and men in the houses a bonus of 1*d.* in the shilling extra. The average for ordinary workmen is put at 22*s.* a week, or, with overtime and Sunday pay, 25*s.* Foremen, of course, receive higher wages.

The vineries are mostly 26 ft. wide, and none of them have any outside borders. One of them covers half an acre of ground. There are long attached ranges of them, as many as sixteen being counted without any divisions between the several spans in some cases. This, of course, implies the production of a great quantity of grapes to ripen at about the same time, as the temperature is the same in all the connected houses. It may be mentioned here that there are 3,000 feet of pipes to one boiler as a rule. The grapes are mainly of the Gros Colmar variety, as they are found to pay best; but there are several houses of Muscats. No attempt is made to produce early grapes, the marketing season being from the end of September till nearly the end of April, with the biggest output in December. Mr. Rochford estimates that grapes kept on vines till March or April waste about 25 per cent. in weight.

As my visit was made at the beginning of May, all the old grapes had been sold, and new fruit, of course, was small; but there was a very fine show in many houses.

Two rods to the vine are grown, and vines five years old completely cover the glass, while some only four years from the planting were found nearly covering it.

Mr. Rochford has given much time to the study of tomato diseases, and has consulted the best scientific authorities as to remedies, trying many experiments; but hitherto he has not met with anything like complete success, although he is able to keep his plants comparatively healthy. Raising the temperature of a house to 77° F., and maintaining it for some hours, checks the common disease (identical with potato disease), but does not cure it. As for spraying with the Bordeaux mixture for the malady, it is apt to cause the leaves of tomatoes to shrivel, which does more harm than the disease itself, in Mr. Rochford's opinion. Chemin is the only variety of tomato grown in the nursery. Many houses are entirely devoted to tomatoes (two crops in the season), and they are also grown in the vineries until the vines are old enough to cover the glass, except in those producing the earliest grapes. The plants are stopped after they have set four trusses of fruit. The atmosphere in cucumber houses, Mr. Rochford says, is too hot and moist for tomatoes to do well in them. A few tomatoes are ripe by the middle of April, grown from seed sown at Christmas; but the great bulk of the supply is later.

Only one variety of cucumber, the Rochford, is grown, and this is produced upon an enormous scale. Some splendid crops were seen on the occasion of my visit. The season of marketing them from the nursery begins in the middle of March.

Mr. Thomas Rochford's adjoining nursery, containing 24 acres actually covered with glass, has already been noticed in connection with flowers. Here also the vineries have no outside borders, and are in great ranges. Here, again, there is a very large and lofty house, covering half an acre of land, erected for the growth of vines on the upright system, which soon proved a failure. Grapes, tomatoes, and cucumbers are very extensively cultivated; but as this branch of the hot-house industry in Cheshunt was sufficiently represented by the great nursery just noticed, my attention at Mr. Thomas Rochford's nursery was almost entirely devoted to flowers.

There are many quite small growers of hot-house fruit and flowers in Cheshunt, and two or three of them were hastily visited. One had made a great success with mushrooms, and another had made tomatoes pay well. These numerous small

holders started with a house or two, and gradually extended their little nurseries. Some years ago they found no difficulty, with good management, in making a successful start, and increasing their small amounts of capital. But it is not nearly as easy for those who start in a small way now, as the competition has grown severe, and profits have been greatly reduced.

One member of the Rochford family has established a large nursery at Stansted, in Essex, a few miles further from London than Cheshunt; but this was not visited.

Leaving Cheshunt, and passing through Waltham Cross and along Enfield Highway, to Ponder's End, glass-house nurseries are to be seen, not only singly, but in groups also. The view of such a great extent of glass, all placed there within a comparatively small number of years, gives a striking impression of the rapid increase of the hot-house industry, and suggests a doubt as to whether it is not being overdone. The majority of the nurseries are devoted to grapes, tomatoes, and cucumbers mainly, though flowers are grown in most of them in winter, and others are occupied chiefly or entirely with flowers.

One nursery has twenty houses 100 ft. long each, all devoted to cucumbers, followed by chrysanthemums. As early as Easter week 500 dozen cucumbers were marketed from this nursery, and the quantity was increased later on. An authority in the district estimated that six dozen cucumbers per plant was a fair average product. In one case a nursery was started about four years ago by a man who is believed to have had hardly any capital. He erected six houses in the first year, and apparently gained profit enough to enable him to put up six more in the following year. It is to be borne in mind, however, that the horticultural builders who supply hot-houses commonly give credit where it is wanted until the crop of the first season after erection has been marketed.

Further on along Enfield Highway there are two nurseries which were erected by members of the Rochford family, one of whom died recently, while the other is the Mr. Rochford who has also a large nursery at Stansted.

Mr. Matthews, in addition to the nursery for flowers at Ponder's End, noticed in the Journal for June, 1898, has one in Enfield Highway, consisting, at the time of my visit, of 41 houses from 100 ft. to 125 ft. in length, devoted to grapes, tomatoes, and cucumbers. When this grower's father came to Ponder's End, in 1862, there was only one glass-house in the district, including Enfield Highway. Now there are miles of such buildings, and Mr. Matthews estimates that the expanse of glass has increased a thousandfold during the last thirty years,

and has more than doubled during the last ten years. In his opinion the expansion has gone quite far enough for the time being. Most of his grape and tomato houses are in spans of six to ten, without divisions between them. Disease and wire-worm were troublesome among tomatoes last season. Mr. Matthews began to cut cucumbers in the middle of March. Some information which he gave showed that the returns from glass-house nurseries vary immensely in different seasons, and that the profit is occasionally very small, or non-existent. Land in the district sells at 100*l.* to 600*l.* per acre, much of it being valuable for building sites. Bare land lets at 4*l.* to 5*l.* an acre, and turf, if known to be required for a nursery, at 9*l.* to 12*l.*

There are many glass-house nurseries in Enfield, Tottenham, Hoddesdon, and neighbouring parishes; but the important district to the north of London, as far as Stansted, probably containing fully one-third of the area of commercial hot-houses in England, has already occupied its full share of this article, and other districts must now receive attention.

Early Production at Worthing.

Favoured with a mild and equable climate, abundance of sunshine, and a soil admirably suited to the vine, the Worthing district seems to be an ideal one for the hot-house industry, and especially for the production of early grapes. The soil is a deep loam over a subsoil of chalk or chalky marl, mixed with flints. The land chiefly valued by nurserymen is a strip of splendid alluvial soil which runs through Worthing, 6 ft. in depth. Land suitable for nurseries sells at 300*l.* to 500*l.* per acre, and lets at about 7*l.* if arable, or at a higher rent if old turf.

Mr. William Sams, of West Worthing, who was the fourth man to engage in the hot-house industry in the district, was very obliging in affording me information. Forty years ago, he stated, there was hardly any glass in the neighbourhood, and it was not until 24 years ago that a substantial growth took place. At the latter period there was less than one acre covered with glass; whereas, last summer, the extent rated in Worthing and the parishes adjoining it, and using Worthing station, was 2,473,000 sq. ft. Allowing for the pitch of roofs, this expanse is equivalent to 45 acres of land actually covered with glass last summer, and by the present time, probably, at least 50 acres are covered. If all the nurseries on either side of Worthing from Southwick, near Shoreham, to Littlehampton, about 35 miles of coast-line, be included, it may be estimated, according to one authority, that 70 acres are covered with glass.

Glass-houses are assessed at no less than 100*l.* an acre at Worthing, Mr. Sams said, or double as much as at Cheshunt.

Rail freights from Worthing to London, including delivery in Covent Garden, are 40*s.* per ton for grapes, other fruits, and flowers, in lots not less than ¼ cwt.; while for cucumbers, the charges are 25*s.* per ton in lots not less than half a ton, and at the rate of 35*s.* per ton for smaller quantities.

Worthing grapes are the earliest produced in England, being marketed from the early part of April. These are the Black Hamburgh, the only variety which will stand such early forcing well. Muscats also are extensively grown, both early and late. Melons are produced to a small extent, and strawberries are forced in some hot-houses, a few of the earliest being ready in January. Other crops under glass are mushrooms, potatoes to a small extent, French beans more commonly, and a few peaches, nectarines, and figs.

The vine is very long-lived at Worthing, as the soil suits it admirably. Mr. Sams has about 100,000 sq. ft. of glass, mostly devoted to the production of grapes, of which he had some fine crops on the occasion of my visits this year and last season. As an illustration of the effect of the fall in prices, he informed me that his net profit is no greater now than it was years ago, when he had only one-third of his present extent of hot-houses.

Tomatoes are going out of Worthing all the year round, though only a few in winter. Growers turn their attention chiefly to early production, for which the old wrinkled varieties are most suitable. Even for late crops, according to Mr. Sams, the soil of the district is not suitable to the smooth varieties. The eelworm is very troublesome, in the old nurseries especially, and more than two years' crops of tomatoes cannot be insured in the same soil. Cucumbers also are extensively produced in the district, and various flowers by a few nurserymen, chrysanthemums in winter occupying some of the houses in most nurseries.

Sixteen years ago all the hot-house produce sent from Worthing was carried to Brighton in ordinary luggage vans, and wheeled round to the London platform. Now there are special fruit vans every Monday, Wednesday, and Friday.

With respect to wages in nurseries, adult labourers get 18*s.* a week at least, men in hot-houses 22*s.* to 25*s.* (or 22*s.* and house and garden, rent free), and foremen 30*s.* to 35*s.*

Having learned from Mr. Sams that Mr. Beer was the pioneer of the hot-house industry as now carried on in Worthing, I paid a visit to that gentleman, who informed me that he was

not the first to engage in the business, but was the first to erect large houses, and to grow grapes upon an extensive scale. Twenty-seven years ago, when Mr. Beer started, there were only a few little hot-houses in Worthing, most of them held by the late Mr. Barnwell, who had been preceded for a few years by Mr. Paul. Mr. Edward Purser also had a few small houses. But when Mr. Beer erected a house 150 ft. by 28 ft., Worthing people were astonished, and predicted disaster; and when they saw the crop of grapes produced after the vines had begun to bear, they declared that there would not be sufficient demand in all England for so large a quantity. Mr. Beer, however, knew what he was about, and was not in any way discouraged by prophecies of ruin, but soon added other hot-houses, one of which was 180 ft. by 30 ft. After two years of denunciation by his critics, he said, there were two years of silence, and then imitation followed as his success became obvious. But even as recently as twenty years ago, only a few men were beginning to follow his lead.

An illustration of the long life of vines at Worthing was afforded by the existence, up to this season, of some which were twenty-six years old. They were reluctantly uprooted a few months ago, when it became desirable to pull down an old house, and erect a new one in its place, and the borders were found full of vigorous and healthy roots.

When Mr. Beer first had grapes to dispose of, and for many years afterwards, Brighton fruiterers came over to his nursery to buy them, taking them home in hand-baskets, with all the bloom upon them. He has always aimed at the production of grapes of fine quality and flavour, and he has had some of the same customers for twenty-five years. As may be imagined, Mr. Beer can remember the time when grapes sold at prices very different from those now current. He mentioned an instance of a single basket of Muscats having been sent to market, just before Christmas, by the late Mr. Barnwell, and sold at 21*s*. or 22*s*. per pound. They were sent by the buyer to the late Emperor of the French.

Mr. Beer grows two rods to a vine, in which he differs from the usual Worthing practice, which is that of growing single rods. The rods are 3 ft. apart. His vines, old and young alike, are healthy and vigorous; but my visit was made too early in the season to see the grapes in an advanced stage. He considers 40° a high enough temperature for keeping grapes through the winter, and only raises it higher to drive the cold and heavy air out of a house and let fresh air in, or to dry the grapes if the air is too damp. The great difficulty in keeping

grapes on the vines through the winter is to steer between damp and mildew on the one hand, and shrivelling on the other.

The Mr. Barnwell alluded to above has been succeeded by two sons, who have two small nurseries in Worthing. In one of these I found grapes, tomatoes, strawberries, French beans, and a few peaches, as well as flowers, being cultivated. Space was economised by growing mushrooms in the pathways of hot-houses, a narrow row of flagstones on one side of each path being used for walking.

Mr. Barnwell begins to force his Black Hamburgh grapes early in December, to get them ready for market early in May. It does not pay to have them ready before the end of April, he says, because old grapes, kept on the vines since the autumn, are in the market up to that time. It is not all gold that glitters in relation to early grapes, as the cost of forcing them through the winter is heavy. Mr. Barnwell showed me a small house which he said would cost 25*l.* for fuel alone during nearly six months of forcing, while the crop might possibly be worth 60*l.* The grapes, however, had not done well in this case, and they were not quite ripe on May 5 last season. They were worth then, Mr. Barnwell said, only 2*s.* a pound, whereas growers used to get 21*s.* a pound early in May twenty-five years ago. The best Black Hamburghs at the time, however, were worth fully 4*s.* a pound.

Strawberries were first ready for market in Mr. Barnwell's nursery last season in the first week of March, when they sold at 15*s.* per pound, whereas by the latter part of the first week in May they were down to 2*s.* But I heard of 2*s.* 6*d.* per ounce as the price obtained for a few very early strawberries in January. Such extremely early fruit is small in yield, and costly to produce. Twenty-three years ago Mr. Barnwell's father sold 250 lb. of strawberries in the first week of May at 10*s.* a pound. Those were times in which hot-houses paid handsomely. French beans are grown in conjunction with other crops, such as strawberries, grapes, or cucumbers. They were worth 1*s.* a pound in the first week of May last season.

There is a great demand for men for grape-thinning in the Worthing district in the spring, and extra men were engaged at 6*d.* an hour at the time of my first visit last season.

The name of Mr. Robert Piper is well known in connection with the great stand which he made on behalf of himself and his fellow-nurserymen at Worthing, in relation to the rating of land covered with glass. He started in 1880, and now has the largest hot-house nursery in the district, 16 acres in extent, and

containing 105 houses, covering about one-third of the ground. About 1,500 tons of coal per annum are used for the hot-houses. Mr. Piper is the most extensive grower of early fruit in Worthing, and probably in England. Last season he began to cut Black Hamburgh grapes in the first week of April, and Muscats in the first week of May. At the latter period Black Hamburghs were selling at 2*s.* to 5*s.* a pound, and Muscats up to 10*s.*, prices much lower than they were for the period of the season some years ago. A magnificent crop of Alicantes was just colouring on May 5, to be ready for market a fortnight later—a very early period for marketing Alicantes. Muscats, and, indeed, all kinds of grapes, were looking remarkably well. The vines are grown on the single-rod system common in Worthing.

A second visit in the present season, on March 11, showed a fine outlook for early grapes; but the start in cutting was purposely timed about a fortnight later than it was last year, because grapes ripened in the autumn are now kept into the first week or even the second week of April, and it does not pay to have early grapes ready before the latter part of the month. Late grapes, it may here be remarked, sold this season at prices low beyond precedent, partly because of the large quantities of Belgian and Cape grapes in the market, but partly also on account of the vastly increased production around London. Quotations for Alicantes and Gros Colmars in the first week of March were only 1*s.* 6*d.* to 2*s.* 3*d.* per pound, prices hardly any higher than they had been in the preceding autumn.

The earliest grapes are forced in lean-to houses facing the south. The only poor crop in the nursery this season was seen in a house in which grapes have been forced early every year since 1880, and this prolonged strain upon the vines has at last begun to tell. Mr. Piper says that Black Hamburghs, forced early, do not yield more than half as much as a late crop of Gros Colmars. He does not keep late grapes after the first or second week of January; but, even so, he had been cutting early or late grapes from the first week in April until the first week in January, until the postponement of the start for a fortnight was made this year.

Mr. Piper forces early strawberries to a considerable extent, growing them in pots on stages, so that they are near the glass, in vineries where the vines are young, and do not cover the glass. The plants are put into the houses in November, and the fruit is marketed from the latter part of January till the end of April. The earliest fruit last year was picked on January 24, and this season on the 20th, when it was worth 2*s.* 6*d.* an

ounce; but this first gathering weighed only $1\frac{1}{4}$ lb., and three days later the price had fallen to 1*s.* 6*d.* an ounce for a choice pound, and 1*s.* 3*d.* an ounce for 2 lb. not so fine. The yield of such very early fruit is so small, and the price falls so rapidly, that it does not pay to produce, in Mr. Piper's opinion. Some years ago the earliest strawberries were worth 3*s.* 6*d.* an ounce. The yield is less than half as much as that of later plants. About 80 lb. of strawberries were marketed this season in the week ended on March 11.

French beans are also forced, the earliest being ready by about the beginning of February, when they are worth about 2*s.* 6*d.* a pound; but they soon come down to 1*s.* 6*d.*, and later to 1*s.* They are grown in pots placed only about three inches apart. The plants in this nursery seen last March were the finest that have been noticed anywhere.

Early tomatoes, to be ready by the middle of January, are placed first in the early grape houses, in pots, and moved into the late houses to ripen. The earliest were worth 4*s.* a pound last year, whereas this season, on January 23, when picking began, they realised only 1*s.* 3*d.*, a price at which they do not pay well, if at all, as the yield is very much less than that of later plants. A few years ago the earliest tomatoes were worth 5*s.* a pound, and in 1863, Mr. Piper remembers, they realised 4*d.* to 6*d.* each. The Old Red, a wrinkled variety, is grown for early forcing. Last year Mr. Piper had about half an acre of outdoor tomatoes, though they are not at all commonly cultivated in the district.

Cucumbers, which are produced on a large scale in this nursery, are marketed all the year round. There are sixty-six hot-houses, most of them 100 to 165 ft. long, devoted to this crop, twenty-five new ones having been erected early in the present year; and two to three crops are grown in each house during twelve months. A cross between the Telegraph and the Rochford is the variety grown. It is expected that about 600 tons will be produced this year. Supposing the weight of the "flats" in which they are marketed to be included in this estimate, this quantity would be equivalent to 1,080,000 cucumbers, as 25 "flats" containing 3 dozen each weigh half a ton.

The nursery is almost entirely devoted to the products named above, the only flowers grown being a few roses and a great quantity of chrysanthemums. The latter, which occupy many of the houses from October to December, are grown as a kind of bye-product, mainly to provide work for the men in the slack season of the year. No visitor could fail to be struck with the thoroughly up-to-date management of this nursery, the

economy with which all the covered space is utilised, or the general appearance of prosperity which pervades all its departments.

Mr. F. E. Sparkes has been previously mentioned as a grower of flowers of various kinds under glass; but a large portion of his nursery is devoted chiefly to grapes, cucumbers, and tomatoes. He says that tomatoes are not very extensively produced in Worthing, partly because they suffer seriously from disease there. As there are over a hundred nurserymen pretty close to each other in the district, it is supposed that disease spreads freely. But it is probable that very early forcing, to which the tomato does not take kindly, is responsible for the unhealthiness of the plants to a great extent. The Old Red variety does best, and, although wrinkled tomatoes sell at 1*d.* a pound less than smooth varieties, Mr. Sparkes believes that they pay best.

Some fine grapes were to be seen in the nursery on the occasions of my visits in both seasons. As an example of fluctuations in prices, Mr. Sparkes said that he started cutting in 1897 with grapes at 4*s.* a pound, and in Jubilee week there was a fall to 9*d.* or even 6*d.* a pound, followed by a partial recovery. He is one of the hopeful class of nurserymen, however, as he states that there were more gluts in the market for hot-house produce ten years ago than there are now, and he thinks that nurserymen are doing quite as well at the present time as they were at the earlier period.

Mr. Sparkes has six cucumber houses, and he forces the produce so as to begin cutting in December. To force rapidly, there are eight rows of hot-water pipes in a house 15½ ft. wide, some of them being under the beds in which the plants are grown. The plants are set out in October for cucumbers to be ready in December, January, and February, and later plants are set at Christmas to fruit up to the end of June. Mr. Sparkes grows a very fine variety of cucumber of his own raising, a cross between the Telegraph and the Rochford, which has become the favourite variety of the district. The soil is changed for each crop of cucumbers, and the growth of the plants is stimulated by the application of nitrate of potash, bones, Manchester town manure (dry), and London dung. The last, however, is not applied until the cucumbers are half grown.

Mr. Sparkes, who is a man full of resources, has adopted a system of using houses with movable lights, in addition to his ordinary hot-houses. He erects wooden framework over a considerable space of ground, in which various crops of flowers or fruit are grown, places lights over the roofs when a crop in a particular space is to be helped forward, and removes them to

another skeleton house for another crop when the first has been brought to maturity. Some of these structures are entirely skeletons, the sides of which are protected by canvas when necessary, the tops only being covered with lights, for protecting chrysanthemums. Others have wooden and glass fixed sides, with fixed tops and ventilators, only the lights covering the main portions of the roofs being movable; while five new ones have sides of brickwork and glass. The last, and most of the other houses with fixed sides, are heated, while the rest are cool houses. Peaches are grown in two heated houses; vines have been or are to be planted in two or three; and strawberries or roses are to be found in others.

Travelling Glass-houses.

A system of movable glass-houses has been introduced by the Horticultural Travelling Structures Company, of London. The houses, which are supplied with or without heating apparatus, are mounted on small wheels, which run on light rails laid down through the space upon which crops are to be raised. They are made in lengths up to 204 ft. and in widths up to 30 ft. During the early part of the year they can be placed over strawberries, bulbs, roses, radishes, or other kinds of produce; next, on the same or different ground, tomatoes can be grown in them; and finally they can be used for chrysanthemums, mushrooms, or mint. If heated, they can be used for grapes during a portion of the year, though the effect of forcing vines for part of the season, and leaving them unprotected for the rest of it, has yet to be proved, I believe.

The idea seems an excellent one, as it embraces rotation of cropping under glass; but the houses cost considerably more than fixed structures, and time is needed to prove how long they will withstand the strain of frequent removal.

Several nurserymen at Worthing have a few of these structures, and, during my last visit, I took the opportunity of inspecting some of them. All but two that were seen are cool houses, and furnaces had only just been put up to heat the two exceptions. On March 10 the majority of the houses had no crop under them. Chrysanthemums had been grown in them in the winter, and tomatoes were about to be planted in them on the same ground. In these cases the houses are moved only once in the year, and it seems doubtful whether enough is thus got out of such expensive structures.

Mr. Barnwell was good enough to show me two of these houses, which he has on one of the two nurseries belonging to

himself and his brother. There is no partition between the two spans, which are 25 ft. wide. They were over radishes early in the year, and tomatoes were to be grown in the same ground, after which it was intended to move the houses over chrysanthemums. The rails and wheels are kept well oiled, so that five men can shift a house. These houses are not heated.

In the adjoining nursery there are eight travelling greenhouses, also unheated, in two sets of four communicating spans. The runners of these houses are not kept oiled, and a great number of men are required to shift them—I think I was told twenty-five. This, however, is not the fault of the makers. In another place, where the ground is slightly rising, it was stated that the labour of moving the houses uphill was very great. The eight spans mentioned above are moved only once a year, tomatoes and chrysanthemums being grown in them alternately.

In another place six spans of travelling cool houses, all communicating, were seen. Nothing was growing in them on March 10, and apparently they are used only for tomatoes and chrysanthemums.

The only heated houses of the kind seen were two, the heating apparatus being a fixture. Early tomatoes were being grown with heat, and when they are over, the houses are to be shifted over early chrysanthemums, after which they will be brought back to their present position for late chrysanthemums. Vines have been planted in one of the places where a house was standing in March. In this case the houses appear to be better utilised than in some others.

The best utilisation of cool travelling houses seen at Worthing was in a nursery where there are six spans, all communicating. Mushrooms are grown in them during the winter and early spring, after which they are moved over strawberries first, and lastly over tomatoes.

Mr. Court, of Belvedere, Kent, whose nursery will be described under the head of "The Forced Strawberry Industry," has six cool travelling houses, each 102 ft. long, and all communicating, which were erected in 1898. He did well to have the width of each house only 22 ft. 5 in., instead of the usual 26 ft., on the ground that roofs of a given area would be too flat if made to cover the greater width. He moves a house by means of a pony pulling on one side of it, and six men pushing on the other, and at present he has not found that the structures have been racked. They had been moved only three times up to last April. The cost was 18*s.* per foot run, including the rails under them, while the extension rails cost 3*s.* 6*d.* per foot run. This year the houses first covered strawberries in pots, which

would be earlier than if in the ground, and the picking of the fruit was expected to begin by the middle of May. The plants were beginning to bloom at the time of my visit on April 8. Without waiting to pick all the strawberries in pots, the houses were to be moved at the end of May, over a lot of strawberry plants growing in the open ground, the expectation being that the fruit would be ripened about a fortnight before fruit not helped by glass would be in the market. In the meantime, tomatoes were to be planted where the pot strawberries were grown, the houses being brought back to cover them as soon as the second lot of strawberries had become ripe. Lastly it was proposed to use the structures for chrysanthemums. By this plan the travelling houses are fully utilised all the year round, as the time to bring strawberries in pots into them will come as soon as the chrysanthemums have been cut for market.

Fruit under Glass in Kent.

The most important hot-house district in Kent is that of Swanley and the surrounding parishes, already noticed in connection with flowers. By far the greater number of the nurseries, however, are devoted to fruit, or mainly to it. The nurseries are a good deal scattered, and I could not obtain an estimate of the area of land covered with glass.

Only two fruit nurseries, besides two to be referred to hereafter in connection with forced strawberries, were visited in the Swanley district, the first being that of Mr. John Wood, of Crockenhill, in which about twelve acres are covered with glass. Mr. Wood grows Gros Colmar, Alicante, and Gros Maroc grapes extensively, and he is beginning to grow Muscats. At one time he grew Black Hamburghs; but in 1876 he had to accept 1*s.* per pound for a lot of grapes of this variety, and he grubbed up all the vines. He made more money of Gros Marocs in the season before my visit than of any other variety. They are fine grapes, with a nice bloom upon them, but are not remarkable for good flavour. Last year Mr. Wood erected a number of very fine vineries, 300 ft. to 360 ft. long, and 25 ft. wide. Most of his old vines are grown on the single-rod system; but he is now adopting the plan of growing two rods to the vine. Having seen grapes in a great number of nurseries, I was most interested in Mr. Wood's peaches and nectarines, which he grows admirably. He has six houses of peaches, making together a thousand feet in length, while he grows nectarines in fifteen houses. The latter were formerly cucumber houses; but Mr. Wood, who has no hesitation in making a

sweeping change when the fancy takes him, gave up growing cucumbers altogether, because he could not get men to stand the heat, and planted the fifteen houses with Rivers's Early Nectarine. He began to sell this fruit last season in the last week of May, when nectarines were worth a guinea a dozen. In the last week of June, when my visit was paid, good nectarines were selling up to 12*s.* a dozen. Peaches began to be ready a little later than the nectarines.

Mr. Wood employs women and girls at 2*s.* a day to do some of his grape-thinning, and says that they do the work more cheaply than men. Some idea of the expense of grape-growing may be formed from his statement that a good crop of Alicantes in a house 400 ft. by 25 ft. cost him 30*l.* for thinning, men being employed. Colmars, he says, do not cost more than half as much as Alicantes to thin. Mr. Wood had a magnificent crop of Gros Maroc at the time of my visit.

The executors of the late Mr. Philip Ladds have about 12 acres of land covered with glass at Swanley, 4¼ acres at Dartford Heath, and about 2¼ acres at Meopham. The land at Swanley where the nursery is situated is a stiff loam on clay or rock, not well suited to the purpose for which it was purchased; and it was made worse by trenching it 3 ft. deep, and bringing the cold and wet subsoil on to the surface. One portion of the nursery is so little suited to vines that they live in it only about seven years, while in another part they improve with age at present. For some years, notwithstanding the unfavourable character of the soil, the late Mr. Ladds was wonderfully successful with tomatoes, the quantities that he sent off from Swanley station being regarded at the time as astonishing. But of late the soil has got "tired" of tomatoes, and they are not nearly as extensively produced as they were at first. Last year they were grown entirely in pots for the first time. Only late crops are produced after pot flowers. Similarly no early grapes are grown, but only Alicantes and Gros Colmars to ripen in the autumn. There are seventeen vineries, including one 686 ft. by 25 ft., covering two-fifths of an acre; while three are 450 ft. by 25 ft.; three, 300 ft. by 25 ft.; and ten, 200 ft. by 12 ft. Fine crops of grapes were seen in some of these vineries. The production of flowers, palms, and ferns has now become a greater consideration in the nursery than the growth of fruit.

In another nursery at Swanley a misfortune occurred, which shows that there are great losses, as well as gains, in the hot-house industry. The tomatoes in thirty-two houses, no fewer than 70,000 plants, became badly affected with the spot disease

last year, and had to be pulled up when in the fruiting stage, and replaced with cucumbers.

Many examples of failure among hot-house and outdoor fruit-growers in the Swanley district have occurred at various times, chiefly among men who have started with insufficient capital, or without a full knowledge of the business, and therefore compelled to trust management to foremen. Indeed, a resident in the district of long standing and full knowledge of the subject declared that a man who started in the glass-house industry without a good knowledge of it was "almost sure to come to grief."

At Bexley Heath and the adjoining parish of Welling, according to the estimate of two nurserymen, there are about fifty acres covered with glass; and a smaller expanse may be found at Dartford Heath. All the glass-houses at these two places have been erected within about twenty years.

Mr. D. W. West, of Bexley Heath, visited last April, has fourteen glass-houses on an acre and a quarter of ground, all covered but the necessary pathways. This nursery is a striking example of a considerable industry on a small area of land. The soil in this part of the district is a thin one over gravel, and not suited to grapes; but in another part of Bexley Heath there is a deep loam over gravel in which vines flourish splendidly. Land sells at about 400*l.* per acre, being valuable for residential purposes. There is some very stiff land over clay in the parish.

Mr. West grows peaches, nectarines, strawberries, tomatoes, cucumbers, and a few pot plants, besides a quantity of chrysanthemums, to occupy the houses in the winter. He had a splendid show for peaches and nectarines this season. In one lofty house he has two rows of standard peaches up the middle, including some of the biggest in England, besides trained trees on either side. To show the size of one of the biggest of the standards, and the success with which fruit is induced to set, it may be stated that, in thinning, 3,000 young peaches were picked off the tree, leaving a great crop to develop. Fruit grows quite as well on the standards as on the trained trees, according to Mr. West's experience, the average size being superior, though there are no such extra fine specimens on the former as there are on the latter trees. No fewer than 750 dozen peaches and nectarines (chiefly peaches) were gathered last year in two houses, one 220 ft. by 20 ft., and the other 223 ft. by 12 ft. The wider house is the one in which standards are grown. Mr. West begins to pick peaches in the last week of May, after forcing from the middle of February; but some growers commence to force at the beginning of January. Nectarines are two or three

weeks earlier than peaches. Alexander is the variety of peach first ripe, followed by Hale's Early, which Mr. West considers his best market peach. Royal George, another of the best, does not flourish in his nursery. Alexandra Noblesse is one of the finest peaches for flavour, but does not colour well, and therefore does not suit the market. This defect applies also to the Gladstone peach. Sea Eagle is one of the finest of late peaches, and a capital market variety. Mr. West has many other varieties. His season for peaches ends in the first week of September, and nectarines are all marketed by about the middle of August. Lord Napier is his earliest nectarine, and one of the best; Humboldt, raised by Mr. Rivers from the pine-apple variety, being also excellent; but the best of all, he says, is Rivers's Orange, a mid-season variety.

Nectarines do not pay as well as peaches. The range of prices is very wide. For example, last year Mr. West sold fine early peaches up to 21*s*. a dozen, and inferior samples when the market was fullest were as low as 2*s*. a dozen. But a guinea a dozen is not the extreme top price, as I heard of 24*s*. and even 30*s*. being realised for very choice and early fruit.

It is important, Mr. West says, to train peaches and nectarines at a fair distance from the glass, because if they are too close, the young shoots get bent back, and it is desirable to keep them straight.

Mr. West grows strawberries only in cool houses, beginning to pick in the middle or last week of May. He grows Paxtons and Royal Sovereigns, and, like most other growers, says that strawberries in cool houses pay best. His estimate of the average yield per pot is 2 oz.; but in one instance he grew a crop over double that average. To show how rapidly strawberries fall in price as the season advances, it is worth while to state that the market quotations fell from 6*s*. to 8*s*. a pound on April 7, to 3*s*. 6*d*. to 4*s*. on April 13, according to Mr. West. Last year the price of forced strawberries fell as low as 2*s*. or 2*s*. 6*d*. a pound, but recovered later on. As to other prices, cucumbers had fallen to 2*s*. a dozen on April 13; and last year fairly good hot-house tomatoes sold as low as 1*d*. per pound for a week or two, and some small ones even lower still, though they were worth 6*s*. to 8*s*. per peck of 12 lb. as late as the latter part of June. In connection with tomatoes, it is worth while to state that one grower at Bexley Heath cultivates them out of doors more extensively than any one else of whom I have heard. He grew 10 acres last year, and was said to be preparing in April to grow 20 acres this season.

Mr. Butler, another Bexley Heath nurseryman, has forty

glass-houses averaging 155 or 160 ft. in length, on a deep and rich loam over the gravel, in which vines flourish admirably. He begins to force Black Hamburghs at Christmas, to be ready for market in June. He grows the Colmar variety extensively, and the Alicante and Muscat of Alexandria to a less extent. The vines presented a very promising appearance last spring. Having seen vines in many other places, however, I gave more attention to peaches and nectarines, which Mr. Butler grows admirably. The trees, all trained up the roofs to within 2½ ft. of the apex—always kept uncovered, to let in sunshine and light—are planted a little over 13 ft. apart. They fill nine houses 160 ft. long and 16 ft. wide, and they were covered with a remarkably regular setting of fruit on April 14 last. Mr. Butler inoculates the blossoms of early crops only, merely shaking the trees of late varieties, to make the pollen fly. He grows Royal George more extensively than any other variety, but also a few Alexanders, a good many of Hale's Early and Sea Eagle, with a few other late sorts. Mr. Frank Butler, son of the proprietor, stated that peaches should withstand forcing for at least twenty years on suitable soil. He considers Hale's Early the best early peach, and Royal George one of the best mid-season varieties. He has known about 29 dozens of ripe peaches to be picked off one tree, after as many had been taken off in thinning. Alexanders become ripe at the end of May or in the first week of June, and the marketing of peaches goes on till the end of August or the middle of September. Mr. Butler considers Rivers's Early Nectarine the best of early varieties, and Lord Napier the best mid-season kind. He has known 32 dozens of nectarines to be gathered from one tree.

Mr. Butler grows generally ten to fifteen thousand pots of strawberries; also tomatoes, cucumbers, and a great number of ferns and other pot plants. He is trying this year a new outdoor tomato, Harrison's No. 1, a smooth variety, which did well with a friend last season. He thinks that tomatoes are too cheap now, except very early ones, to grow extensively under glass.

The Forced Strawberry Industry.

Thirty years ago the commercial growers of forced strawberries might be counted on the fingers of one hand; but two growers were known in Covent Garden about twenty years earlier. The first was a Mr. Smith, of Twickenham, who apparently began to force strawberries for market at least fifty years ago. He is not now living; but Mr. Richard Clarke, who followed his example forty-seven years back, was visited by me at Twickenham last

summer. He stated that Mr. Smith began forcing strawberries many years before he started, but did not mention any other market grower who was as early in the field.

At the present time there is a considerable number of men who make strawberry forcing their principal business. The great majority of them are grouped together at Belvedere, Erith, Eltham, Swanley, and Bexley Heath, all in Kent, while there are growers at Hampton, Twickenham, Swanley, Worthing (already referred to), and scattered places, who make strawberries less of a speciality.

The little colony of strawberry forcers at Belvedere is particularly interesting, because it consists almost entirely of growers who work on a small scale; also because it affords the most considerable example that I have seen of the use of unheated glass-houses in this country.

Between twenty and thirty years ago, Mr. George Stapley, senr., and a partner began to force strawberries for market in the Belvedere district, and his brother, Mr. Alfred Stapley, senr., whom I visited, followed shortly after. But the latter is not certain that a Mr. Flickers did not grow a few strawberries in his hot-houses when Mr. George Stapley was a boy. Mr. Alfred Stapley still forces strawberries on a considerable scale, entirely in cool houses. That he believes they pay best in cool houses is proved, as he pointed out by the fact that he has some great piles of pipes in his nursery unused. His nursery is at Northumberland Heath, Erith, a short distance from Belvedere.

The Belvedere glass-house industry is carried on under what may be styled a compact and simple system. Strawberries occupy the houses from Christmas, or a week or two earlier, till the middle of June; then tomatoes or cucumbers take their place up to the middle of October; and chrysanthemums follow up to mid-December or Christmas.

The soil at Belvedere is gravelly, or a loam over gravel—at least, where I found strawberry growers thickest. It sells in small lots at about 400*l.* an acre; and one piece close to land bought at this price was let on lease at 5*l.* per acre until sold recently.

It was pleasing to see quite a nice little business established in many an instance on a very small holding. The first grower visited at Belvedere was Mr. Molseid, who, I regret to learn, has died since my visit of last year was made. He had an acre and a half of his own, upon which he had erected 1,400 ft. run of glass-houses, 12 ft. wide, mostly cool houses. In them he grew about 16,000 strawberries, followed by tomatoes and cucumbers, and lastly by 8,000 chrysanthemum plants, all in

one year. The strawberries last season were chiefly Paxtons; but there were also some Royal Sovereigns and British Queens. Royal Sovereign, it may be observed, is coming rapidly into use for forcing as well as for an outdoor crop. In the unheated houses, the strawberry plants were beginning to show blossoms on April 6, and they were expected to fruit from the middle of May till the middle of June. The blossoms were fully out in the heated houses; but the plants were not so forward as in some hot-houses seen elsewhere. The plants were very healthy, and promised to fruit well.

Mr. Molseid was good enough to explain the method of growing strawberries for forcing. Plants are only used once for this purpose, and, after they have done fruiting, they are planted in the open, the runners from these plants being struck by trailing them over small pots of earth. After the young plants have become well set, they are repotted in bigger pots ($4\frac{1}{2}$-in. pots), and kept out until about Christmas, when they are placed in the houses, 1 ft. apart each way, or 1 ft. by 9 or 10 in. when there is no more room. In a 12-ft. house there were five rows of plants on either side of the path. Strawberries have been usually grown on a staging to bring them near to the glass. In lofty houses seen in some places, they are placed on shelves hanging from the apex of the glass roof. But except for the earliest forcing, the pots are now more commonly set on the ground.

The main crop of tomatoes was just sown on April 6; but there were some plants in pots ready, no doubt, to follow the earliest strawberries in the heated houses. The chrysanthemums are struck in 2-in. pots in January, in the houses, and are put out in the open ground 2 ft. apart in April, to be taken in again just when beginning to show blossoms in October. There are other small nurseries adjoining Mr. Molseid's, and similar in character, including one held by Mr. Warren, which was inspected.

Mr. Court, a near neighbour of the growers just named, started sixteen years ago in his present nursery, then 4 acres in extent. He has recently added $4\frac{1}{2}$ acres to the area. In the old nursery there are 2,300 running feet of glass-houses, and in the new one the six travelling houses already noticed.

When Mr. Court started there were very few glass-houses in Belvedere, whereas now there are many thousands of feet, and in nearly all strawberries, tomatoes or cucumbers, and chrysanthemums are grown. He thinks that cool houses hold their own well against heated houses for strawberries, and he does not use heat much for tomatoes, but needs it for chrysanthemums. He

had, last year, one house of arum lilies, which were just over on April 6, and were being followed by tomatoes. The lilies are planted in the borders of the house in September, and planted outdoors again after they have finished blooming, early in April.

Last year Mr. Court had 20,000 strawberry plants in his old houses, and this year 40,000 in the old and new nurseries. On the morning of my second visit, on April 8 last, he had begun picking Royal Sovereign strawberries, 9 lb. having been sent to market. The house containing this earliest lot of fruit presented a most pleasing appearance, the crop being the best I have ever seen, probably averaging fully $\frac{1}{4}$ lb. per pot, or at least an ounce over the average obtained by good growers generally. All the crops in the heated houses had set their fruit well. They consisted entirely of Royal Sovereigns, the Paxtons, about equal in number, being grown in the cool houses. The pots in nearly all the houses were on the ground; but on my first visit I saw some plunged in a mushroom bed on a stage of corrugated iron, under which was a second bed for mushrooms alone. The strawberries are said to start the better for being plunged in the manure of the mushroom bed, and the fungi grow between the pots.

With respect to manure, Mr. Court uses a little bone-dust when transpotting strawberry plants, but not afterwards, as he says it would burn the plants. Afterwards liquid manure from the stable, soot, and sometimes native guano are used to stimulate growth and fruiting.

No attempt is made at Belvedere to force very early strawberries, as at Worthing, because it is considered that such forcing would not be profitable. Mr. Court explained that, whereas strawberries for fruiting in April or later do best when the pots are placed on the ground, very early plants require to be placed on stages, or on inverted flower-pots, to promote root action. All his plants were placed in the houses in December, as soon as chrysanthemums were out of the way; and for his earliest crop he began firing in the middle of January.

A curious piece of information was elicited by a remark about the directions in which glass-houses are made to run. It is usually supposed that houses running north and south or north-east and south-west are best, because the sun shines about equally upon both sides of the roof; but Mr. Court always grows his best crops of strawberries in houses running east and west, though the fruit is a little earlier on the south than on the north side of each house. For tomatoes, when planted across the house, he regards this direction even more advantageous than

for strawberries, because the midday sun shines along the rows of tomato plants.

The cost of a cool house, 12 ft. wide, was put at 40*l.* per 100 ft. run last year; but glass has become dearer since, and the cost of the house, therefore, would probably be a little higher. Wider houses cost more, of course, but not in equal proportion to extra width.

Mr. Court grows tomatoes for the most part after strawberries, the variety being Duke of Clarence, a favourite at Belvedere. He grows mushrooms somewhat extensively, followed by cucumbers.

With respect to prices, the Belvedere growers, of course, do not realise such high rates as very early Worthing fruit commands; but the day before Mr. Court began to gather his strawberries the Covent Garden quotation was 6*s.* to 8*s.* per pound. Last year the price, after falling, recovered, so that strawberries from cool houses made more money than the later portion of the crop in heated houses.

The earliest strawberries seen in Belvedere on the occasion of my first visit were grown by Mr. Budd in his nursery of an acre and a half, containing 1,400 ft. of glass-houses 12 ft. wide. There were three heated houses last year, from which 60 lb. of strawberries had been picked by April 6, and a good quantity of fine fruit was still coming on.

This grower presented a very gloomy view of his industry. He said that, fourteen years ago, at the period of the season then current, forced strawberries sold at 14*s.* per pound, whereas a Covent Garden salesman had informed me that 6*s.* per pound was the highest price on the day preceding my visit to Belvedere. Mr. Budd admitted that strawberries had made 32*s.* per pound last year; but they were only an extremely small quantity, forced very early. In his own case, to begin picking about April 1, he commenced heating his houses at Christmas, and each of the three heated houses of 110 ft. by 12 ft. had cost 5*s.* a week for firing alone, which would be about 4*l.* 10*s.* per house up to the end of April. He estimated the return for strawberries at only 12*l.* per house, or 3*d.* per plant, taking an average for three or four seasons, and questioned whether his crop would pay him; while he added that tomatoes were even less profitable than strawberries, and that chrysanthemums pay scarcely at all. Unless by "return" Mr. Budd meant net profit, it is impossible to reconcile his estimate with other evidence collected.

Growers appear to have a very vague idea as to the average yield of strawberries per plant; but, from evidence I have been able to obtain, it seems safe to put it at fully one-sixth of a

pound, where the plants are not forced very early; and, even at 4*s.* per lb., the result of such production would be about 33*l.* per house of the size named above.

The earliest crop Mr. Budd has known to have been gathered in cool houses was that of 1893, when the plants were in blossom on March 26, and picking was begun on April 25, instead of about the middle of May, which is the usual starting period at Belvedere. The forced strawberry season ends about the middle of June, when open-air fruit from the Southampton district is usually ready.

Mr. Rodwell, another grower of forced strawberries, stated that when he started in the business, ten years ago, there were only about six growers in Belvedere, whereas now there are about twenty. He has a thousand running feet of glass-houses, some cool and some heated. In his nursery cucumbers are grown in cool houses as well as with heat, an arrangement not at all common. Like other nurserymen in the district, Mr. Rodwell thinks that cool houses pay at least as well as hot-houses.

At Erith the admirably managed nursery belonging to Mr. George Stapley, noticed in reference to hot-house flowers, was visited. There are about 2,000 running feet of glass-houses in this nursery, and Mr. Stapley has another in Sussex. Strawberries were less noticed than some very promising tomatoes 2 ft. high and beginning to show fruit on April 6. The seed for the plants was sown in November. Tomatoes are usually ready for sale from the hot-houses in June, and from the cool houses, after strawberries, in September.

At Hampton a small nursery was visited, the owner of which took a very depreciatory view of his business. He grows French beans and strawberries in his hot-houses, and began picking the former at the beginning of March, and his strawberries on April 22. As at Belvedere, tomatoes are grown after strawberries, and chrysanthemums later still in the year. Although there were 1,200 ft. run of hot-houses, the owner declared that the year's profit, after paying 40*l.* for hot-water pipes, was only sufficient to leave him about 18*s.* a week for his arduous labour.

The yield of strawberries, he said, did not average over 1 lb. to eight pots, which would be only 2 oz. per pot. In the preceding season, he added, he obtained only 700 lb. of fruit from 8,000 pots, or barely $1\frac{1}{2}$ oz. per pot. This was a very poor crop, and it is strange that the price of hot-house strawberries did not average over 3*s.*, or at most 3*s.* 6*d.* per pound, as some Belvedere growers had named 4*s.* to 5*s.* per pound as their

average, although they grew most of the fruit in cool houses, so that it was late. But it is the case in all avocations that some men fail where others succeed.

At another Hampton nursery in which strawberries are forced somewhat extensively, the manager said that the yield averaged about $\frac{1}{4}$ lb. per pot. Royal Sovereign, Paxton, and La Grosse were the varieties being forced in this nursery. Strawberries, the grower said, require a great deal of attention, watering, and feeding with manure to induce them to yield well. A large quantity of mint is forced in vineries in this nursery, and it was somewhat astonishing to learn that 600 lb. of mushrooms had been picked from one house 250 ft. long, although they were grown only on the outsides of the two beds of mint, that ran the length of the house.

Two of the most extensive growers of forced strawberries were visited at Swanley. Mr. Henry Staples grows many thousands of plants—probably more than any other nurseryman who can be named. But his nursery was seen in the early part of the present year, after the strawberry districts already noticed had been visited. Therefore it is not necessary to repeat details of culture, which are practically the same in all cases. It may be mentioned, however, that the plants, in pots of course, are wider apart than in some nurseries, or fully 15 in. from plant to plant. Mr. Staples grows strawberries in both cool and heated houses. In the former he takes cucumbers after the fruit, and in hot-houses tomatoes or cucumbers, except where strawberries are grown in the vineries. In the winter chrysanthemums and other flowers occupy most of the houses; but where cucumbers are grown after strawberries, the latter are ready to come in as soon as the former are finished. The vines in this nursery, it may be mentioned, are remarkably flourishing. There are three or four rods to the vine, and there are outside borders.

Mr. Emmerson, of Swanley, had 25,000 strawberry plants, all in heated houses, about 1 ft. apart each way, in 32 size pots. Tomatoes follow strawberries almost exclusively; but there are many cucumber houses, and ferns and flowers are also grown.

Hot-house Fruit Culture in Various Districts.

It is probable that in the whole of England and Wales, outside the districts dealt with in the preceding pages, the extent of commercial glass-houses is not equal to that of the parish of Cheshunt alone. The only ones inspected in these outside districts

were those of Mr. Thoday, at Willingham, Cambs, Mr. Frank Craze, near Penzance, and a few in the Scilly Isles and other narcissus-growing districts. Mr. Thoday has eight well-constructed houses, each 250 ft. long, in which he produces grapes, peaches, nectarines, and strawberries, as well as flowers. He begins to market early Alexander peaches in the first week in May, and grows both early and late grapes. He sticks to the fine old British Queen strawberry, regardless of the popularity of the Royal Sovereign, which does not equal the old sort in flavour, and thus he averages about 5*s.* per pound for his produce.

Mr. Frank Craze has nineteen hot-houses, covering 26,760 sq. ft., or about two-thirds of an acre altogether. He grows grapes, cucumbers, tomatoes, and French beans in them, as well as narcissi and arum lilies. Nearly all his early grapes (Black Hamburgh) were marketed by the middle of May last year. The earliest were sold at 4*s.* 6*d.* per pound; but by the time of finishing the cutting of this variety the price had gone down to 2*s.* 6*d.* Tomatoes are grown after cucumbers, the latter being marketed from Christmas till the end of April. In Mr. Craze's opinion, very early tomatoes do not pay for the heavy expense of forcing them during the winter, as it is difficult to get the fruit to set well. Between the crops of cucumbers and tomatoes all the earth to a certain depth in the border is removed, fresh soil being brought into the houses.

Mr. Dorrien Smith is the only owner of extensive hot-houses in the Scilly Isles, and altogether he has 28,800 sq. ft. covered with glass. Tomatoes are grown in these houses after forced narcissi and a few other flowers, from 17 to 19 tons being produced in the year, quantities, it may be observed, equivalent to about 26 to 29 tons per acre for one crop in the season. The tomatoes are grown in pots, and have to be shifted a good deal to keep them out of the way of the flowers in their early stage. Notwithstanding this disadvantage, very early tomatoes are produced, a few being ripe on March 14 last year. The old large red variety, supposed to be the Conqueror, is grown for early production, as smooth sorts would not set well during the winter. Mr. Dorrien Smith doubts whether it pays to force tomatoes very early; but judging from the promise of the plants seen, and what was learned as to prices, I should have supposed that the crop would be highly profitable. Information was obligingly given as to prices realised in preceding seasons. In 1898 tomatoes were first sent to market on March 22 at 1*s.* 3*d.* per pound, and the total quantity shipped was 19½ tons. The lowest price of the season was 2½*d.*

These are gross prices, from which expenses have to be deducted. The average net return per pound, clear of transport and market expenses, was 3·16*d.*

In 1897 marketing was begun on April 27 at 1*s.* 4*d.* per pound; the lowest price of the season was $2\frac{3}{4}$*d.*, and the average, clear of all expenses of transport and marketing, was 3·05*d.*

In 1896 the start was on April 16 at 1*s.* 8*d.* per pound, the finish on September 10 at $2\frac{1}{2}$*d.*, and the net average 3·7*d.*

In the six years from 1895 back to 1890 the net averages were 3·62*d.*, 3·86*d.*, 3·14*d.*, 3·67*d.*, 4·42*d.*, and 3·8*d.* It will be observed that the average was practically the same in 1896 as in 1890, and the fall in 1897 was partly due to the fact that the start in marketing was eleven days later, while the earlier crop of 1898 brought a somewhat higher net average. Nearly half the tomatoes in 1898 were shipped in April, May, and June, which accounts for the net average being much higher than the gross minimum.

The total quantity of tomatoes exported from the Scilly Isles last year, Mr. Sandrey, agent to the shipping company, informs me, was 52 tons. In 1897 it was 50 tons. The freight to London, including dock dues, water carriage, transfer to the railway, and rail carriage, is 8*s.* from St. Mary's, and 6*d.* to 1*s.* more for conveyance from other islands to St. Mary's.

At Chelmsford, in Essex, Mr. J. P. Pash informs me, there are eight commercial hot-house nurseries, and there are others in the surrounding parishes: Broomfield, Writtle, Springfield, Roxwell, and Galleywood, the number having increased during the last three years. The tax-collector says that the assessment on the ground area of the glass-houses is 6*l.* per thousand square feet, the rateable value being 4*l.* The latter assessment is equivalent to over 174*l.* per acre, which is 74*l.* more than it is at Worthing, and about 124*l.* more than at Cheshunt. The poor and county rates, amounting to about 2*s.* 9*d.* in the pound, are upon the rateable value, while the district rate of about 3*s.* 2*d.* is upon one-fourth of the rateable value, as the glass-houses in relation to the latter rate are regarded as parts of market gardens, and thus entitled to a deduction. They are very heavily rated on the whole, however, the assessment being enormous.

Probably one of the largest hot-house nurseries outside the districts specially noticed is that of the Toddington Orchard Company, in Gloucestershire. With respect to other districts not mentioned in the preceding portion of this article, readers may be referred to the section of the paper in the Journal for 1898, Part III., headed "Flower Farming in the Provinces," in

which the hot-house nurseries, concerning which correspondents in different counties afforded information, are noticed. In most of them grapes, tomatoes, and cucumbers, as well as flowers, are produced.

Concluding Remarks on Fruit-growing.

There is no lack of instruction upon the principles and practice of fruit cultivation, packing, and marketing; and, although for the regular business of market-gardening practical training is essential, there are hundreds of thousands of persons who grow fruit upon a small scale, and who might grow it much better than they do, and make more of what they have to spare, if they would follow the guidance open to them.

Apart from the large standard works on horticulture, there are some cheap manuals of recent publication, written by high authorities, in which clear directions upon the selection of varieties of fruit, planting, pruning, cultivation, manuring, and other points are more or less fully set forth. Among these particular attention may be called to Mr. John Wright's "Profitable Fruit-Growing" (E. H. May, Fleet Street), a prize essay written for the Fruiterers' Company; and the two equal Royal Horticultural Society's prize essays on "Hardy Fruit-Growing," by Mr. L. R. Castle (manager of the Duke of Bedford's Fruit Farm) and Mr. S. T. Wright (Superintendent of the Society's Garden at Chiswick), published by the Society. For information as to the cost of planting, cultivation, manuring, gathering, packing and marketing of fruit, and the returns from average crops, I have not seen any other publication which gives such full details as are supplied by Mr. Cecil H. Hooper, of Swanley, Kent, in a paper which he read at the Surveyors' Institution in 1897, and published in the *Transactions* of the Institution, though he strangely omits to give an estimate of planting so common a mixture as one of plums or apples with gooseberries or currants between and under the trees. Mr. Hooper is himself a fruit-grower, and in making his estimates he was assisted by other growers. Mr. Hooper makes the cost of preparing land for fruit by steam power 2*l.* 3*s.* per acre, or by horses 1*l.* 13*s.*; the planting of standard cherry and apple trees on pasture, including a little manure on the surface for each tree, 15*l.*; the planting of bush apples 9 ft. apart, with strawberries, including 12*l.* for trenching and 13*l.* 6*s.* 8*d.* for 40 tons of dung and spreading, 65*l.* 9*s.* 3*d.*; the preparation, manuring, and first year's cultivation of bush fruit, 19*l.* 15*s.* 11*d.*; the planting and first year's cultivation of raspberries, with the

picking and marketing of a little fruit, 20*l.* 10*s.* 4*d.*; manuring, preparation of the land, planting, and first year's cultivation in the case of strawberries, 21*l.* 12*s.* 8*d.*; the annual cultivation, and half-cost of biennial manuring of mature bush fruit, with picking and marketing of produce, 16*l.* 17*s.*; the annual cultivation, manuring, picking, and marketing of raspberries, 18*l.* 14*s.* 3*d.*; and the annual expenses of strawberries, 16*l.* Rent, rates, and taxes are added to the cost of annual cultivation, but have been deducted, because they differ widely in different cases; and, in the case of strawberries, supposed to stand for only four years, one-fourth of the first year's cost (6*l.*), added by Mr. Hooper, is not included.

Other details are given by Mr. Hooper in his score of tabular statements, and he includes some estimates of returns from average crops, which, however, vary in different seasons. It may be added that Mr. Wise, manager of the great fruit farm of 1,000 acres at Toddington, in the discussion on Mr. Hooper's paper, estimated the cost of planting an acre of top and bottom fruit on clean land, including the preparation and manuring of the land, at 24*l.*; the annual outgoings per acre of fruit in full bearing at 20*l.* to 25*l.*; the capital necessary for hiring planted fruit land in full bearing, without any valuation to pay, at 30*l.* per acre at least; and the capital necessary to a man who takes bare land and plants it with fruit at 80*l.* per acre.

Before visiting the principal open-air and hot-house fruit districts my impression was that there was more opening in this country for an extension of the culture of fruit under glass than in the open; but what I saw and heard during my investigation completely transposed my judgment in this respect. The enormous increase of glass-houses in recent years appears to have brought the supply of hot-house produce, even at greatly reduced prices, at least up to the level of the demand; and as most of the existing nurserymen keep on extending their expanse of glass, the opening for new competitors is not at all a bright one. Moreover, the vast scale upon which some men conduct the hot-house industry puts small producers at a great disadvantage, not only because the extensive producers can grow grapes and other fruit more economically than small growers, with the possible exception of those who do all or nearly all their own work; but also, and still more, because the former have greater advantages in transporting and marketing their fruit. Even five years ago men who began the hot-house business in a small way got on quickly if they understood their work, and were shrewd men of business, as well as industrious; but in all quarters I learn that they have now an uphill battle.

Careful readers will have noticed that the details as to prices given in my reports show a much greater fall in the prices of hot-house than of open-air fruit. The production of grapes and tomatoes especially appears to be becoming, if it has not already become, excessive in relation to the demand, under the existing system of distribution, which involves the payment by consumers of 50 to 100 per cent. more in prices than growers receive. The best openings for new nurseries appear to be, not where they are now to be found in great groups, and especially not in the neighbourhood of London, but in suitable spots near the great centres of population in the midlands and the north, or large towns elsewhere not already well supplied with nurseries. By such a selection of a locality the beginner may build up a retail trade in hot-house fruit, or at least a trade with local fruiterers and grocers, thus avoiding railway charges and salesmen's commissions to a great extent, though it may often be advantageous to send certain kinds of produce to a distant market. Above all a man who has no knowledge of the hot-house industry should avoid entering his capital in it, trusting himself in the hands of a foreman, as experience shows that such a venture usually leads to disaster. Some years of training in different nurseries are desirable for any young man who is determined to become a grower of hot-house fruit.

With respect to open-air fruit-growing, the opening for new venturers appears to me to be much brighter than in the hot-house industry, not because the area of fruit in this country is too small, but because the level of efficiency, from the selection of varieties to the packing and marketing of the produce, is very much lower in the former than in the latter branch of enterprise. In other words, whereas the practice of the majority of hot-house nurserymen is so skilful, so well up-to-date, and so thoroughly a high-pressure system that a new competitor, however well trained, will find it difficult to rise above mediocrity, the converse is true of open-air fruit-growers. Many, and an increasing proportion, of the latter, as will have been gathered from my descriptions of visits to notable examples, are thoroughly efficient in all branches of their business, and are in possession of plantations of the best market varieties of fruit, well cultivated, pruned, and otherwise managed. But the extent of fruit plantations thoroughly up to the mark in relation to varieties and treatment of trees and bushes, and in connection with which the packing and marketing of the produce is equally satisfactory, is small in proportion of the total fruit area of the country.

This last remark must not be regarded as of the nature of

censure, because it is impossible that old fruit plantations, which make up the greater portion of our fruit area, can be filled with the best varieties of fruit trees and bushes, many of which are of recent introduction. Moreover, knowledge as to the best treatment of fruit trees has advanced greatly in recent years, and old plantations, as a rule, suffer from the neglect or errors of the past, however skilful their present holders may be. Lastly, although the majority of professional market fruit-growers may be well up to the standard in skill, there are multitudes of contributors to the fruit supply who are either ignorant of the best methods of culture and marketing, or careless in their application. The bad condition of the great majority of farm orchards is notorious, and many landowners, farmers, and amateur gardeners who have planted fruit on a more or less extensive scale have mismanaged their undertakings from first to last.

For these reasons new growers of open-air fruit for market have opportunities of succeeding by means of superiority to the majority of those with whom they will compete, provided that they possess the requisite knowledge, energy, and capital. Mr. Albert Pell, who has spent a long life, and is an owner of land he has planted with fruit, in a great fruit district, declared at a recent meeting of the Farmers' Club, that there was no chance of success for fruit-growers except in districts favourable in reference to soil, climate, and nearness to a railway or a good market; and even under these conditions, only for men who have had experience in the industry, and are prepared to devote their unremitting attention to it. This view of the case has been expressed to me by other authorities in different parts of the country.

The principal object of the inquiry entrusted to me was to obtain information as to the recent development of flower and fruit farming in this country, the circumstances under which those industries are carried on, and their prospects for the future. In the second division of this report, when summing up my account of flower farming, I have remarked upon the great increase in that industry, both in the open and under glass; in the third division the statistics of hardy fruit have been given, with numerous other details; and in this last article estimates of the expanse of commercial glass-houses and the production of fruit in them are presented, with some comparisons of past and present prices.

The general conclusions arrived at are that supplies of flowers and fruit as a whole are increasing at least as rapidly as the demand, while the production of bulbous flowers and hot-

house fruit appears to be expanding excessively, with the system of distribution as it exists at present. But it is to be observed that there is a very wide margin between the prices paid by consumers of flowers and fruit and those received by producers, partly owing to a cumbrous and extravagant system of distribution, and that it is probable that a very great increase in the consumption of these products might be developed by more economical methods of supply. Some improvement in this respect has taken place in recent years, with the assistance of the railway companies, and it is to be hoped that progress in this direction will be continuous.

It remains to tender my sincere thanks to the numerous gentlemen named in these reports as having allowed me to see their nurseries or plantations, and given me valuable information.

WILLIAM E. BEAR.

70 Onslow Gardens, Highgate, N.

GEESE AND GEESE-BREEDING.

IT is recorded that on the grave of a good housewife the ancient Greeks placed the figure of a goose, as a tribute to her quality of vigilance. And to the same useful instinct is attributed the saving of Rome when in danger of capture by the Gauls, who were hard-pressing the Empire City nearly four hundred years before the Christian era. The birds which rendered this invaluable service had been spared, in spite of great scarcity of food, as they were sacred to Juno. But records of the goose can be traced back to an even more remote antiquity, if we may accept the testimony given to us on some of the tablets in the tomb of Tighe, in Egypt, for there is shown the system of cramming these birds by pellets of food. Certainly no member of the poultry yard has so long been brought into the service of man. Its chief claim to favour, however, has been by reason of its economic value. Hehn tells us that "by the Greeks the goose was considered a graceful bird, admired for its beauty, and an elegant present for favoured friends," but either the goose or our taste has changed, for no one now thinks of keeping the ordinary varieties for ornamental purposes, though the Egyptian is sometimes used in this manner. Throughout the centuries it has been cultivated for its flesh, its feathers—for did not Pliny lament that the Romans had arrived at such a state

of effeminacy that even the men could not lie down to rest without a feather pillow?—and, ere the days of steel pens, for its quills, by means of which the writing of the world was done during many centuries. We are, therefore, dealing with a species which has been a servant of man in many ways, and has had the good fortune to preserve more of its earlier type than any other race of bird under domestication. Charles Darwin says that, "hardly any other anciently domesticated bird or quadruped has varied so little," and this statement is supported by naturalists generally.

Origin of Geese.

Unlike the domestic fowl and the turkey, neither of which is indigenous to Europe, the former coming from Asia and the latter from America, the goose in its wild form is a denizen of Europe and North Africa, and this fact doubtless explains much in relation to it. But members of the same family are known in other parts of the globe. Hehn[1] indicates that references to the goose are found in Sanskrit writings, and says that "it would be rash to conclude from this that the goose was a tame domestic animal among the primitive Aryan stock before the Great Migration; it was doubtless well known and much sought after on the lakes and streams, and in the swampy lowlands, as it is now among the nomads and half-nomads of Central Asia. Where it was still abundant and easy to obtain there was no necessity for breeding it artificially in confinement; and so long as men's manner of life was unsettled, a bird that takes thirty days to hatch, and a proportionate length of time to rear its young, was unsuitable to the economy of a pastoral people. But when comparatively stationary settlements were found on the shores of lakes, the young birds could easily be fetched down from their nests by boys, have their wings clipped, and be brought up in the households; if they died the attempt was repeated, until it finally succeeded, especially as the wild goose is, comparatively speaking, one of the easiest birds to tame." As already stated, the wild goose, commonly called the Grey-lag (*Anser ferus*), is distributed all over Europe, but it conducts its young to the shores of the Mediterranean, both Northern and Southern, there to rear them, breeding, however, in the colder latitudes.

Of wild geese the varieties known in this country at the present time are the Grey-lag, already mentioned, the Bean, the

[1] *Wanderings of Plants and Animals from their First Home.* By Victor Hehn, p. 278.

White-fronted or Laughing goose, and the Pink-footed. It is very generally concluded that our domesticated varieties are all descended from the Grey-lag, which at one period bred extensively in the fen districts of Eastern England, but since the drainage of those districts it has been compelled to find a place elsewhere. In Scotland, both on the mainland and in the western islands, it is found, but to a much greater extent in Ireland, especially in some of the central counties. The Bean goose is much more common, and large numbers of the White-fronted geese arrive as soon as winter sets in on the Continent of Europe. Between the Grey-lag and the Bean there are resemblances which are apt to mislead. At one time it was suggested that the Chinese goose was of a distinct species from the Grey-lag, but Mr. Blythe testified that the two breed together, and that their progeny were fertile. His opinion was that the common goose of India was a hybrid between these types. What has led naturalists to conclude that the domestic goose owes its origin to the Grey-lag is not only that the two will breed together, but that there are strong resemblances between them. In Wingfield and Johnson's *Poultry Book* (edition 1853), Mr. Yarrell is quoted as saying that "the Zoological Society of London, possessing a pinioned wild Grey-lagged gander, which had never associated with either Bean goose or White-fronted goose, though both were kept on the same water with him, a domestic goose, selected in the London market from the circumstance of her exhibiting in her plumage the marks which belong to and distinguish the true Grey-lagged species, was this season (1841) brought and put down to him. The pair were confined together for a few days, became immediately very good friends, and a sitting of eight eggs was the consequence. These eggs were hatched and the young proved prolific. Some were hatched in two following seasons, and some of their descendants still remain at the Gardens." And when at the Regent's Park the Grey-lag and the domestic goose have been placed side by side the resemblances between the two proved most apparent. It may, consequently, be taken as an accepted opinion that the origin of our domestic varieties is to be found in the Grey-lag goose. The method of domestication is not recorded, so far as I am aware, but we may suppose that it would be either by securing eggs or young birds from the nests of the wild parents.

Charles Darwin[1] writes, "Although the domestic goose certainly differs somewhat from any known wild species, yet the amount of variation which it has undergone, as compared with

[1] *Variations of Plants and Animals under Domestication*, vol. i. pp. 304–5.

that of most domesticated animals, is singularly small. This fact can be partially accounted for by selection not having come largely into play. Birds of all kinds which present many distinct races are valued as pets or ornaments; no one makes a pet of the goose; the name, indeed, in more languages than one is a term of reproach. The goose is valued for its size and flavour, for the whiteness of its feathers which adds to their value, and for its prolificness and tameness. In all these points the goose differs from the wild-parent form; and these are the points which have been selected." One other distinct gain from domestication is the increase of size, and this is noticeable in nearly all birds and animals which have adapted themselves to the altered conditions of life, and to the greater certainty of food resultant from domestication. And it is also true that more eggs are produced by the tame goose than by her wild sister.

Uses of Geese.

We have already seen that the goose has valuable qualities apart from its succulent flesh. But this fact needs to be amplified, in order that we may realise its importance to mankind. As the Rev. E. S. Dixon wrote many years ago: "Roast goose, fatted, of course, to the point of repletion, is almost the only luxury that is not thought an extravagance in an economical farmhouse; for there are the feathers to swell the mistress's accumulating stock of beds, there is the dripping to enrich the dumpling, pudding, or whatever other farinaceous food may be the fashion of the country for the servants to eat, there are the giblets to go to market, and there is the wholesome, solid, savoury flesh for all parties in their due proportion." But the flesh of the goose is losing somewhat of the favour with which it was formerly held, and this tendency is one which needs to be watched as time goes on. Perhaps it is merely a return to former customs. With the increase of earning power on the part of our working people, and the making of Christmastide a family festival, there grew up an enormous demand for geese at this season. But Michaelmas in older days was specially linked with the eating of geese. A very apocryphal story is told that good Queen Bess originated the custom in commemoration of the defeat of the Spanish Armada, but this cannot be accepted as the time of year does not fit in with that event. Brand, in his *Popular Antiquities*, says that bringing in a goose "fit for the lord's dinner" on Michaelmas Day was customary in the time of Edward IV., and that Gascoigne, who died eleven years before the Armada, wrote:

And when the tenants come to pay their quarter's rent,
They bring some fowls at Midsummer, a dish of fish at Lent;
At Christmastide a capon, at Michaelmas a goose,
And somewhat else at New Year's tide, for fear their leave flies loose.

The most probable explanation of this custom is that at Michaelmas geese were more plentiful than at any other season, that they were easily brought into good condition for killing by after-harvest feeding, and that they were fit objects with which to celebrate the successful harvest tide. So far as we can learn the custom is peculiar to England. In France and in Denmark the goose is eaten on St. Martin's Day and St. Martin's Eve respectively, though Twelfth Day and Shrove Tuesday both share in the goose eating in France. The old saying "If you eat goose on Michaelmas Day you will never want money all the year round," has died out. Its origin is explained in the *British Apollo* as follows:

The custom came up from the tenants' presenting
Their landlords with geese, to incline their relenting
On following payments.

Perhaps, also, it meant that those who had so prospered in their harvest as to be able to eat goose on Michaelmas Day were ensured against poverty during the winter.

Apart from the edible flesh there is the fat, which is very valuable for culinary and other purposes. Goose grease is relied upon by old-fashioned housewives for chapped and rough hands far more than any druggist's preparations. Giblet pie is a favourite dish with many people, some of whom prefer it to the flesh. And then there is the liver, which is so grossly abused and misused, not by the geese themselves, as in the case of man, but as a result of the forced and unnatural feeding to which they are subjected. Happily the system is unknown in this country, and we should strenuously fight against its introduction. If those who enjoy *pâté de foie gras* could but once see the way in which the geese are treated, their desire for this so-called delicacy would be gone. It is a cruel and barbarous system, which has come down to us from the Roman times when the Empire was luxuriously riding to its fall. Pliny spoke of it thus, "Our folks are wiser, who are aware of the goodness of their liver. In those that are crammed it increases to a great size; when taken out, it is laid to swell in milk mixed with honey. And it is not without cause that it is a matter of debate who was the first to discover such a dainty, whether Scipio Metellus, of consular dignity, or M. Seius, a Roman knight at the same epoch. But (what is certain) Messalinus Cotta, the

son of Messala, the orator, discovered the method of cooking the web of their feet, and fricasseeing them in small dishes along with cocks' combs." *Pâté de foie gras* consists of the diseased livers of geese and ducks and the fat which surrounds the livers, the birds being fed to repletion upon the richest foods, and kept in a heated atmosphere, and as a result the liver is enormously enlarged. This organ with its fat will often weigh from 3 to 4 lb., and the price is 2*s.* 6*d.* to 4*s.* per lb. Fortunately we have not the *foie gras* production in this country, and I hope we never shall.

Not the least important part of the goose is the feathers, which have been celebrated for their soft texture, and their suitability for beds and pillows. The old Roman writers might criticise, as we have seen, the effeminacy of those who preferred feather pillows, but in cold climates these bed furnishings are likely to retain their popularity. At one time geese were largely kept to produce quills for making into pens, and it must be acknowledged that a good deal of cruelty arose from the large demand for quill pens, and the constant plucking which took place. A writer in the *Monthly Magazine*, December 1823, is quoted by Moubray as saying that in this plucking, which was stated to take place five times a year, "the skin and flesh are sometimes so torn as to occasion the death of the victim; and even when the fowls are plucked in the most careful manner they lose their flesh and appetite; their eyes become dull, and they languish in a most pitiable state, during a longer or a shorter period. Mortality also has been periodically very extensive in the flocks of geese from sudden and imprudent exposure of them to cold after being stripped, and more especially during severe seasons and sudden atmospheric vicissitudes. There are many instances in bleak and cold situations of hundreds being lost in a single night, from neglect of the due precaution of comfortable shelter for as long a time as it may appear to be required." But with the introduction of the steel pen, the demand for quills was so reduced, and the price so depreciated, that the returns were little more than sufficient to pay the cost of plucking. Apart from this system, however, we may say with Roger Ascham, tutor to Queen Elizabeth, "Well fare thee, gentle goose, which bringeth to a man, even to his doore, so many exceeding commodities. For the goose is man's comfort in warre or peace, sleeping or waking. What prayse soever is given to shootynge, the goose may challenge the least part of it. How well does she make a man fare at his table. How easilie dothe she make a man lie in his bedde. How fitte even as her feathers be only for shootynge, so be her quills for writing."

Age of Geese.

It is very generally admitted that the goose may attain a much greater age than any other of our domestic poultry, and yet remain profitable. Willoughby mentions one that had attained the age of eighty years, when she had to be killed by reason of her mischievousness. In Mr. Tegetmeier's *Poultry Book*, the late Mr. E. Hewitt is quoted as saying that, "Perhaps there is scarcely any description of poultry that can boast of the extraordinary age of the goose, combined with continued productiveness. In poultry breeding we continually find, in other instances, that age brings with it decreased powers of production, and, at length, such birds cease breeding altogether. I could mention several instances of geese attaining twenty or five-and-twenty years of age, and still, year by year, both laying and sitting as abundantly and as early as in former seasons. This remark, however, applies especially to birds which have, during the whole period, enjoyed free and unlimited range. I am aware of the existence of an old goose that has attained the age of nearly forty years, and that has never failed during that period to raise one or two good broods annually. She does not show any apparent mark of extreme old age, grazing freely as heretofore, and being very attentive to her offspring. Ganders, on the other hand, as far as my knowledge extends, never maintain their productiveness; and, generally speaking, they become at the age of a few years only perfect pests to all the weaker inhabitants of the farm, are easily irritated, especially if they have been teased, and really dangerous to young children, from the extreme violence and unexpected nature of their attacks." The general custom is to run a young gander even where old geese are kept for breeding. In the report of the Rhode Island State Board of Agriculture (1896) Mr. W. Rankin records that a goose was owned by one family at Boxford, Mass., for 101 years, and was then killed by the kick of a horse. She had laid fifteen eggs, and was sitting on the nest, when a stray horse approached too near; she rushed off in defence of her eggs, seized the horse by the tail, and was killed by a kick. The age here stated may be an exaggeration, for there is always a tendency to elongate the period of life in such circumstances, but the fact remains that geese are long livers.

We are accustomed to regard the goose as a stupid animal, but how this opinion was first formed it is impossible to state. There are certainly many evidences in disproof. The vigilance already referred to may arise from fear, though it is attributed in some cases to keenness of scent. But cases of reciprocal

affection are by no means uncommon. Lord Malmesbury states that Lord Byron, after buying a goose and fearing it might be too lean, fed it every day for a month, with the result that the poet and the bird became so mutually attached that, when September 29 arrived, he could not kill it, but bought another, and had the pet goose swung in a cage under his carriage when he travelled. After four years he was moving about with four geese. Many other instances could be cited, but are needless. It may however be mentioned that the goose is one of the most affectionate of birds for its own companions, and this fact modifies the manner of treating the birds when finally put up for fatting.

Distribution of Domestic Geese.

Although we have no statistics which can be relied on to tell us how many geese were kept a hundred years ago, it may be safely concluded that the number was greater in Britain than at the present time. At that period there was a much wider extent of unenclosed land over which the birds could wander without danger of injury to crops. We are told that during the reign of George III., 6,288,810 acres of land were enclosed. The farms also were much smaller, and corn-growing had not then become the mainstay of British agriculture. It is found even now that, in those districts where farms are moderate in extent, a much greater number of geese are maintained than elsewhere. But at the period named, and well into the present century, commons were a distinct feature of our rural life. Where commons still remain, geese are usually bred to a considerable extent. These alterations in conditions frequently offer explanation of changes, for which otherwise it is difficult to account.

Unfortunately we have no figures to help us to a just appreciation of the number of geese kept in these closing years of the nineteenth century. In 1884 and 1885 the agricultural returns included poultry in the annual enumeration of live stock. It is to be regretted that since the last of these two years this valuable and instructive table has been omitted. Although it may be contended that the figures were not entirely reliable, yet probably they were approximately as nearly correct as is possible. Of course many breeders of geese would be omitted, as the returns only included those occupiers of not less than a quarter of an acre of land, and thus cottagers who, by means of their commons rights, were enabled to keep a flock of geese, would be excluded, except

in the case of Ireland, where these small occupiers are included. We are therefore restricted to the 1885 figures as the last available; these for the various sections of the United Kingdom were as follow:—

	Geese.
England	615,724
Wales	234,146
Scotland	35,440
Ireland	2,133,609
Total, United Kingdom	3,018,919

It is of interest in this connection to learn how far the distribution of geese was affected by the methods of farming carried on in different parts of England. In the Agricultural Returns for 1885 the following division is made:—

	No. of geese	Per cent.
In grazing counties	427,460	69·4
„ corn counties	188,264	30·6
	615,724	100·0

But the figures are given in greater detail in Table I. on the next page, which shows the distribution in the individual counties. These I have divided in accordance with the plan adopted in the above-named returns.

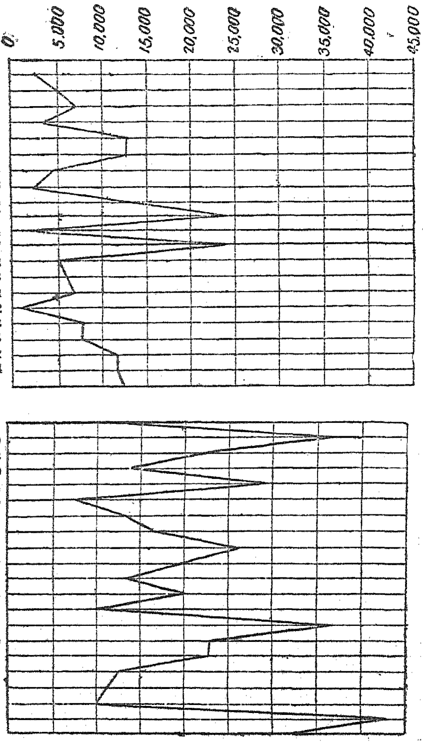
It will be seen that there is great variation, and in Table II. is set out the number of geese per 1,000 acres of cultivated land. From this latter it is at once apparent how much more the breeding of geese is pursued in grazing than in corn-growing districts, with two exceptions, namely Lincoln and Norfolk. We must, however, remember that the time of year when these statistics are collected (June) is when the geese would be in the hands of breeders, who had not yet sold them to the corn farmers, and the Irish and foreign goslings had not begun to arrive. In September the numbers would be vastly increased and more evenly distributed. But, it may be assumed, that all enumerated in June would be English-bred, except a moiety of the breeding stock.

Varieties of Geese.

The breeds of geese which have been brought into the service of man are not very numerous, and are less than in other classes of poultry. It is evident that there has not been nearly the same general attention given to geese as to fowls or ducks, probably from the fact that they were less adaptable to ordinary conditions

TABLE I.—*Distribution of Geese in English Counties*, 1885.

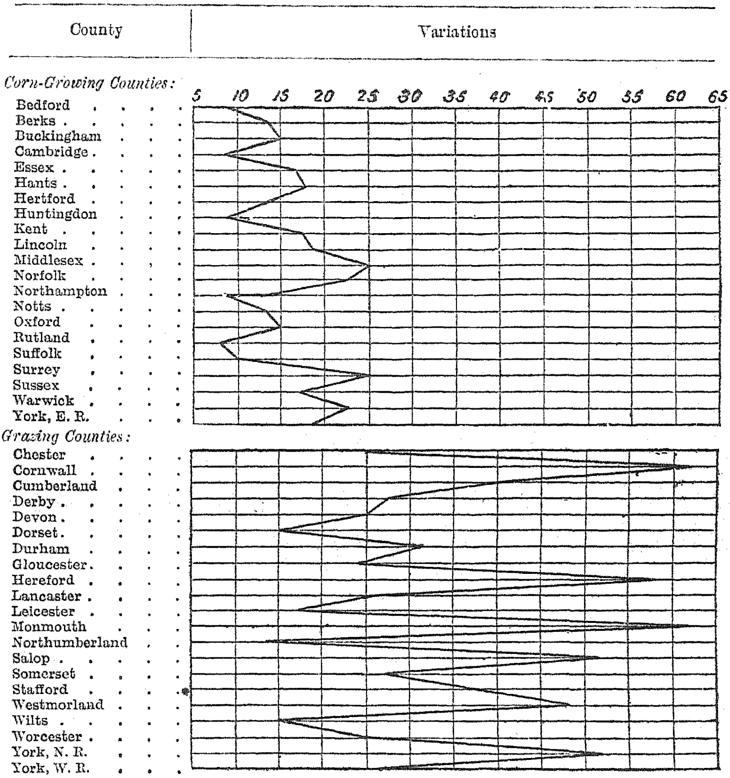
County	No. of Geese	Variations
Corn-Growing Counties:		
Bedford	2,314	
Berks	5,032	
Buckingham	6,418	
Cambridge	3,929	
Essex	13,159	
Hants	12,979	
Hertford	4,808	
Huntingdon	1,878	
Kent	13,074	
Lincoln	29,537	
Middlesex	2,844	
Norfolk	23,547	
Northampton	5,272	
Notts	5,793	
Oxford	6,182	
Rutland	62	
Suffolk	7,983	
Surrey	7,125	
Sussex	11,112	
Warwick	11,284	
York, E. R.	12,852	
Grazing Counties:		
Chester	13,817	
Cornwall	36,339	
Cumberland	23,633	
Derby	14,579	
Devon	29,384	
Dorset	7,260	
Durham	13,159	
Gloucester	16,684	
Hereford	26,099	
Lancaster	20,856	
Leicester	[illegible],170	
Monmouth	14,958	
Northumberland	10,182	
Salop	36,452	
Somerset	23,770	
Stafford	22,471	
Westmorland	12,418	
Wilts	11,365	
Worcester	10,216	
York, N. R.	43,871	
York, W. R.	32,377	



of civilised life, and that in countries less thickly populated the wild birds could be shot as food, and thus there was not the same need to breed them in captivity. Geese are not kept, so far as we aware, in any country as egg producers, except for breeding purposes. If at any time goose eggs had become a recognised article of food, it is more than likely we should have found a much wider distribution of these birds. Yet in early times selection took place, for nearly two thousand years ago the Romans preferred the white goose for the reason that the livers were regarded as finer in flavour and quality than those from such as had coloured feathers. In Western Europe, following on the same lines as were adopted by breeders in Italy long before, two varieties only were kept. Gervase Markham[1] nearly three

[1] *The English Husbandman*, by Gervase Markham, 1615.

TABLE II.—*Number of Geese per* 1,000 *Acres of Cultivated Land in English Counties*, 1885.



TOTALS:

England	25	geese per 1,000 acres of cultivated land.
Wales	83	" " " "
Scotland	8	" " " "
Ireland	141	" " " "
United Kingdom	63	" " " "

hundred years ago said: "Now for the choyse of Geese, the largest is the best, and the colour would be white or gray, all of one paire, for pyde are not so profitable, and blacks are worse: your gander would be knavish and hardy, for he will defend his Goslings the better." The blacks here referred to are unknown now. Whether they were absolutely black or simply dark in plumage it is impossible to tell, for upon this point I have not found any reliable references. All the later writers deal with the white and grey as being bred almost entirely under domestication, though Willoughby, Cuvier, Buffon, and others speak of

different varieties, chiefly, however, from the naturalist's point of view. The names accorded to these are very misleading indeed, the same race being described under several cognomens. For instance, in Rees's *Cyclopædia* (1819) it is stated that "there is a sort of Spanish geese that are much better layers and breeders," without attempting any description, so that it is impossible to determine to what breed the writer was referring.

The races now recognised as more or less useful for domestic purposes are

Toulouse	Chinese	Danubian
Embden	Egyptian	Russian
African	Canadian	

and it will be found that any others named are *de facto* included in the above. We shall therefore confine our attention to these. In this country and in Western Europe the first two named, Toulouse and Embden, are almost exclusively kept, either pure or crossed; but in America, where goose breeding is an extensive industry, the African, Chinese, and Canadian are bred to a considerable, and, apparently, an increasing extent.

Toulouse.

History.—It is very difficult to discover why the name it now bears should be given to this breed of geese, for grey-plumaged members of the race have been known since the days of the Roman Empire. All the records I haye been able to discover have spoken of "gray" or grey geese, and in Britain, as we have seen from Gervase Markham, this colour was recognised early in the seventeenth century. The nomenclature of poultry is most misleading. To many breeds of the various races have been given titles which would at first appear to connect them specially with some place or district, but on inquiry we find that they have no special relation thereto. It is very evident that geese are bred extensively in the district of France of which the city of Toulouse is the centre. I find that the number of geese kept in the Haute Garonne, of which Toulouse is the capital, is the second highest of any department of France, only being exceeded by Allier, which is in the Bourbonnais region. It is probable that greater attention had there been paid to questions of size of body and colour of plumage than elsewhere, giving the Toulouse birds a higher stamp than others. Hence any breeder importing stock for the improvement of his own birds would be tempted to dignify them with a special name as hall-mark, and thus in process of time it secured general adop-

tion. There can be no question that sentimental considerations of this kind go a long way. We have a case in point which supports this view. A breed or type of fowl is at the present time being sold under two names. When designated by the one it will command more than twice the price obtainable if called by the other. Yet they are undoubtedly one and the same. We can only conclude, therefore, that the term Toulouse was given to designate the grey goose as improved by stock obtained from the south of France. Unfortunately, so far as I am aware, the precise period when it was introduced is unknown, but from the evidence of books it must have been in the early part of the present century. One writer says that they were imported into England from Marseilles, but does not give his authority for this statement.

Description.—The Toulouse is the largest of our domestic geese, and frequently attains a very great weight. At some of the Bingley Hall (Birmingham) Shows, in the days when size was regarded in judging, ganders were exhibited which weighed 49 lb. the couple. The appearance is that of a deep-fronted, wide, massive bird, strong and powerful in build, with a thick head and neck, quite in keeping with the general structure. The line of body should be very even from breast to paunch, almost level with the ground, and the paunch itself is very heavy. The *tout ensemble* is massiveness, with large size of frame. The bill and feet are orange-coloured, and a striking characteristic of this breed is the dew-lap on the throat, or gullet, which is well developed. The back, wings, and thighs are of a dark, even, steel grey, each of the feathers being laced with a much lighter shade, nearly a pure white. The flight-feathers, however, are free from this lacing. The breast and under parts are a clear grey, partaking of a lighter shade near the thighs. The stern and paunch are pure white. The tail also is white, and across its centre is a wide band of grey.

Economic Qualities.—Size has had a considerable influence in giving the Toulouse its important position. With so big a frame there is ability to carry a large amount of meat, and there can be no question that these birds are very fleshy. But it can, without injustice, be said that its flesh is rather coarse, as compared with other breeds. To those, however, who have not been trained to these fine niceties of taste, this is less important than quantity, and hence for the Christmas trade amongst those who could only indulge in such a luxury once a year it met the demand better than any other. The Toulouse is a slow grower, and cannot, as a rule, be got ready much before Christmas. Hence it cannot be depended upon for the

Michaelmas market, needing the additional weeks to Christmas in order to fully develop. Toulouse geese must be well fattened in order to fill up the loose skin, and when properly finished are very imposing. Some of the specimens exhibited at the Smithfield Table Poultry Show in December 1898 were wonderfully fleshed. The Toulouse goose is a good layer, and will frequently give as many as forty to fifty eggs in one season, but she is not a reliable sitter, and many birds do not sit at all.

Embden.

History.—It is evident from what has already been stated that white geese have for many centuries been favourites with breeders, and have been very widely distributed throughout Western Europe. Apart from other considerations, the white feathers have a greater marketable value than grey, and this fact, even though not a feather was sold, would impress the minds of many breeders, and lead them to favour a white variety. In this case the name is derived from the town of Embden in Hanover, but it is interesting to note, as giving point to what has already been stated regarding the Toulouse upon the question of nomenclature, that the first geese of this variety recorded as imported into the United States of America were obtained from Bremen, and were described as Bremen geese. The goose industry is a very important one in several of the German provinces, and vast numbers are bred around Embden. I am informed that the majority of these are white, and of the type known to us under the name given. Here, again, the newer importations have impressed both name and character upon the birds already kept, and in process of time the descriptive term white became merged in the new name Embden.

Description.—The Embden is very distinct in appearance, apart from colour of plumage, from that of the Toulouse. The neck is longer and finer, with a long thin head, and the dew-lap which characterises the Toulouse is entirely absent in the Embden. The body is not so deep in front, or carried so low between the legs, and thus it has a somewhat slighter appearance. The back, however, is broad, and the frame compact, whilst the tightness of the plumage is deceptive in that the bird looks smaller than is really the case. The paunch is full, and the stern broad. Of course the plumage is pure white, without any coloured feathers whatever, and the only change is found in the bright orange bill, legs, and feet. These birds are really heavier than their appearance would indicate, but, whilst occasionally very

large specimens are found, as a rule they scale less than the Toulouse.

Economic Qualities.—The greater value of white feathers has already been referred to, but we shall deal with this aspect of the subject later on, for, unfortunately, the feather value of geese has not received in this country the attention it deserves. The leading characteristic of the Embden geese is their rapidity of growth, which is a very important point in their favour, one that will probably increase their popularity in the future even more than has been the case in the past, for reasons to be afterwards discussed. At an age when the Toulouse is in very raw, lanky condition, quite unfit for killing, the Embden is plump and fleshy, so that we find the latter is chiefly depended upon for the autumn trade. During the last few years I have carefully compared the geese exhibited in the dead classes at the Dairy and Smithfield Shows respectively, with the result that at the former, which is held in October, the Embden predominates, whilst at the latter, held in December, the Toulouse is more in evidence. As a question of cost in feeding, Embdens can be brought into condition for killing the more cheaply, especially as they do not need much beyond the usual stubble feeding, and thus the comparative returns would be greater unless a much higher price could be obtained at Christmas, which, of late years, has certainly not been the case. The eggs produced by the Embden are rather larger than those from the Toulouse, and are usually laid earlier in the year, but they are not so numerous, as the Embden is a very persistent sitter and an excellent mother.

African.

History.—The variety to which the name African has been given by American breeders would appear to have originally been identical with what is now called the Chinese, and there are very close resemblances between them, the differences being no greater than are found in many breeds of domestic poultry. But there are sufficient of these differences to warrant the African and Chinese receiving separate treatment. It is more than probable that this is the one called by Buffon the "Spanish" goose, the same designation being applied in Rees's *Cyclopædia*, as already quoted. In an American work published in 1845 the author says that the Guinea or African goose "is the largest of the goose tribe which has fallen under our notice; it is the size of the swan, and it often weighs more than twenty-five pounds. We have now in our possession one pair . . . which will weigh, in common ordinary condition, over twenty pounds each." As

showing the difficulty in tracing the history of this breed, the following quotation will help to support the theory that the African and the Chinese were one and the same, referring as it does to the latter variety: [1]

Confusion, therefore, and perplexity are the certain lot of whosoever attempts to trace this bird in our books of natural history. Its place of birth has excluded it from all monographs or limited ornithologies. In very few systematic works is it mentioned at all, which is remarkable of a bird so striking in its appearance, which there is every reason to believe must have been domesticated for a long period. The uncertainty that has existed as to its correct name and really native country may be one cause of this. Like the Jews or the Gipsies, it has not been allowed to claim a place among the natives of any one region; and like many others furnished with a variety of aliases, it ends by being altogether excluded from society. The old writers call it the Guinea Goose, for the excellent reason, as Willoughby hints, that in his time it was the fashion to apply the epithet "Guinea" to everything of foreign and uncertain origin. Thus, what we at this day erroneously call the Muscovy Duck was then called the Guinea Duck. Not long back it was common with us to refer every strange or new object to a French source. Spanish Goose is another title, probably as appropriate as Guinea Goose. Bewick has given an admirable woodcut of this bird, but he has evidently selected the gander, which is taller and more erect than the female, though to both may be applied Willoughby's description, "a stately bird, walking with its head and neck decently erected." Bewick calls it the Swan Goose.

An opposite opinion is put forward by Mr. I. K. Felch, president of the American Poultry Association, and a well-known breeder, who in a letter to Mr. Chas. O'Flagg [2] says:

The African Goose, I believe, has been credited to Africa—the region near Zanzibar. It is a goose as heavy as the Embden or Toulouse; has a shorter, thicker neck, and darker grey colour than the brown China; knob and bill are black, with a prominent dew-lap—a kind of feathered throat wattle; and a voice harsher and heavier than all others. My own belief is that it is a species indigenous to Africa. We cannot say that it is like the brown Chinas or the domestic goose of India, all of which have longer and more swan-like necks, while the African weighs all of six pounds more than the Chinas. I think that they were imported to this country long before the white and brown Chinas were received.

The differences between the two kinds may be attributed to changes of condition and climatic influences, probably with crossing, the records of which have been entirely lost.

Description.—As we have small acquaintance with what is called in America the African goose, the following description is quoted from the report just mentioned:

African geese have a more erect carriage than either the Toulouse or Embden, but not so erect as the modern brown and white Chinas. The

[1] *Ornamental and Domestic Poultry*, Rev. E. S. Dixon, M.A., pp. 88–9.
[2] *Rhode Island Agricultural Experiment Station Report*, 1897, p. 432.

body should be long and large, well developed through the shoulders and breast; the neck moderately long, of fair size and gracefully curved; head rather large, with moderately long, stout bill, and a knob or protuberance at the base of the upper mandible. There should be a heavy dew-lap or pendant fold of skin under the throat. The bill and knob should be black, and the eyes hazel or brown. The colour of the plumage of the back, wings, and tail is dark grey, shading to light grey on the breast and under parts of the body. A dark brown stripe extends from the head down the back of the neck. Legs, dark orange in colour, with black claws. The notes of this goose resemble those of the brown and white China much more than those of the Toulouse and Embden breeds.

The last statement is thus confirmatory of what we have already maintained—namely, that the African and Chinese were originally one and the same.

Economic Qualities.—It is a little difficult to obtain exact information as to the qualities of this variety of geese. The American standard is that the adult African gander shall weigh at least 20 lb., and the goose 18 lb., the young gander 16 lb. and the young goose 14 lb. But in the Rhode Island report[1] the heaviest two-year-old male is recorded as weighing 16 lb. 2 oz., the heaviest two-year-old female 14 lb. 12 oz.; the young gander 13 lb. 2 oz., and the heaviest young goose 14 lb. 8 oz. The average of Africans was heavier than that of either Toulouse or Embden. The other observations show that the Africans laid the fewest eggs, but some valuable comparative statistics which are given later on, showing the relative values of various breeds, are sufficiently suggestive to warrant our dealing with them in detail.

Chinese.

History.—As previously intimated, it is our opinion that this variety is closely related to, if not actually the progenitor of, what is called in America the African goose. Such evidence as is obtainable shows that they were originally received from China. The Rev. E. S. Dixon, in his work on *Ornamental and Domestic Poultry* already referred to, says that in 1848 Mr. Alfred Whittaker, of Beckington, Somerset, owned a flock which "were from imported parents and were hatched on board ship from China," and adds that about this time a number of specimens were to be seen at the Zoological Gardens in Regent's Park. He further says: "It has names enough to fill a menagerie: China goose, Knob goose, Hong Kong goose, Asiatic goose, Chinese swan (*Cygnus sinensis*, Cuvier), Guinea goose, Spanish goose, Polish goose, Anas and Anser Cygnoides,

[1] *Rhode Island Agricultural Experiment Station Report*, 1897, p 544.

Muscovy goose, and probably many more besides." But very possibly this list is exaggerated. Certain it is that the variety has at different times been known under several designations—namely, Chinese, Knob, Hong Kong, Asiatic, Swan, and Guinea goose.

Description.—There are, in reality, two varieties of Chinese geese, the brown and the white. In both of these the carriage is distinctively different from the ordinary type, in that the body is carried upright, similar to that of the Pekin duck. This, combined with a great length of neck, is sufficient to explain why in some instances it has been termed the "Swan" goose. There is also a mass of folded skin called the "dew-lap," as in the Toulouse. In walking the head is thrown well forward, thus imparting a tall, graceful look to the bird. The head is rather large, with a slim bill, until the knob is reached exactly at the base of the upper mandible. In the brown variety the bill and legs are orange, with the knob black or dark brown; the body colour is a greyish-brown on the back or upper parts, passing to white or whitish-grey on the abdomen. The front of the neck and breast are a rather yellowish-grey or brown, and there is a very dark brown stripe running down the back of the head to the body, the head itself being often of a dark brown, as are the wings and tail. In the white the plumage should be pure, though often there is a pale stripe from the head to the body; the bill, knob, and legs are orange. It is evident that in America the breed has been bred on more defined lines than elsewhere, and this fact will account for some divergences of description found between English and American writers. Chinese geese have a rather disagreeable harsh voice. The standard weights are: adult gander, 16 lb.; adult goose, 14 lb.; young gander, 12 lb.; young goose, 10 lb. It will be seen that the differences between African and Chinese are very slight, apart from colour of plumage and size of body—namely, carriage: African, moderately erect; Chinese, very erect; neck: African, moderately long; Chinese, very long; bill: African, stout; Chinese, slim. The size of the African is, however, about one-fourth greater than that of the Chinese.

Economic Qualities.—These birds are excellent layers, and in some cases have been known to lay in the autumn of the year. The eggs are smaller than from ordinary geese. In regard to the quality of flesh, there is a considerable difference of opinion. Some breeders state that the meat is superior to that of the ordinary goose. In the Rhode Island Report [1] it is stated:

[1] *Rhode Island Experimental Station Report*, 1897.

China geese are not favourites with those who raise goslings for sale to poultrymen, who fatten them and put them on the market as green geese. They are too small to be profitable for such a market. When a small-boned moderate sized goose is required for the fall or Christmas trade, these breeds would prove valuable, as they lay well, and, with proper care in selecting breeding stock, large fowls should be raised. The brown Chinese especially seem very vigorous, hardy and active, but pick hard, and require care in dressing to look well. The white China . . . is usually not so difficult to pick and handsomer in appearance when dressed.

Egyptian.

History.—It has sometimes been contended that this variety should not be included among the races of geese intended for practical purposes, but should be classed with ornamental breeds, and there is a measure of truth in this statement. But for a reason which will be obvious later on, I have decided to include it, more especially as its value for crossing purposes has yet to be determined.

It may be identified on many of the old sarcophagi and bas-reliefs, where it is represented with singular fidelity in carving by the ancient Egyptians (by whom it was revered as an emblem of parental affection), while it is rudely delineated upon the pottery of the Nile. These birds are generally to be seen in considerable flocks on the banks of the rivers, and near ponds and tanks, uttering their peculiar cry, something between a bark and a quack, excepting during the breeding season, when they are usually met with in pairs. They are excellent swimmers and divers, and can progress under water for a considerable distance.[1]

Description.—The Egyptian is a small goose, usually measuring from 27 inches to 28 inches in length, and having a bill slightly over 2 inches long.

In the male, the head and the neck are hoary, the occiput a rusty colour, as also the stripe round the eye and down the neck. There is a castaneous ring around the lower part of the neck; the upper back, scapulars, tertiaries, and a patch on the back, castaneous, some of the feathers being intermixed or sprinkled with black, and the inner webs of some of the tertiaries grey. The whole of the remainder of the breast and the under surface is a light iron yellow, sprinkled with brown, except the abdomen, which is pure white; the vent is an iron red, the lower part of the tail and the spurious wings black, the second wings metallic green, and the shoulder and wing coverts white, the greater ones having a bar of black across the tips. The eyes and legs are orange. Some specimens have orange-coloured bills, and others a reddish purple. The bar of the wing is unusually narrow and rich in lustre, and the pencilling or marking on the flanks, thighs and breast most beautiful. The Egyptian goose is very different in formation from other varieties, is somewhat erect in carriage, yet short-necked; it is Asiatic in the appearance of the head, the tail sloping down from the back, the whole body long for the size of the bird, and the legs somewhat short. In

---

[1] *Ornamental Waterfowl*, by the Hon. Rose Hubbard, p. 44.

the female, which is slightly smaller than the male, the chestnut patches round the eyes and on the breast are smaller.[1]

Economic Qualities.—This species breeds very well in confinement, is a good layer, and the flesh is fairly good, though capable of improvement, which would probably be effected by domestication. The male bird is, however, very quarrelsome. The standard weights are: adult gander, 10 lb.; adult goose, 8 lb.; young gander, 8 lb.; young goose, 6 lb.

Canadian.

History.—What is known as the Canadian goose is the wild bird of this species found in North America, where the vast extent of unoccupied country afforded it an opportunity of breeding in the natural way. It has, apparently, been brought under domestication in the usual manner, but it is more than probable that there has been a considerable amount of crossing, so that the tame bird is not only more than twice the size of its wild progenitors, but also some of its characters have been modified. It is bred in both Canada and the United States to a greater extent than any other variety.

Description.—The best description of this goose is found in the pages of the great American naturalist, Audubon, who

Head small, oblong; bill shorter than the head; neck long and slender; body full, slightly depressed; feet short, stout, placed behind the centre of the body; legs bare a little above the joint; wings of moderate length, with an obtuse protuberance at the flexure; plumage close, rather short, compact above, blended on the neck and lower parts of the body. The feathers of the head and neck very narrow, of the back very broad and abrupt, of the breast and body broadly rounded; wings when closed extend to about an inch from the end of the tail; tail very short and rounded; bill, feet and claws black; iris (eye) chestnut brown; head and two upper thirds of the neck glossy black; forehead, cheeks and chin tinged with brown; lower eyelid white; a broad band of the same across the throat to behind the eyes; rump and tail feathers also black. The general colour of the upper parts is greyish brown, the wing coverts shaded into ash grey; all the feathers terminally edged with very pale brown, the lower part of the neck passing into greyish white, which is the general colour of the lower parts with the exception of the abdomen, which is pure white, the sides, which are pale brownish grey, the feathers tipped with white, and the lower wing coverts which are also pale brownish grey. The margins of the rump and the upper tail coverts pure white. Female similar in colouring, although the tints are duller, the white of the throat is tinged with brown; the lower parts are always more grey, and the black of the head, neck, rump, and tail is shaded with brown.

[1] *Pleasurable Poultry Keeping*, by Edward Brown, F.L.S., pp. 228-9.
[2] *Birds of America*, vol. vi., pp. 194-5.

In size the wild birds are as follow: gander, 7 lb.; goose, $5\frac{3}{4}$ lb. On the other hand, the domesticated Canadians are given as: adult gander, 16 lb.; adult goose, 14 lb.; young gander, 12 lb.; young goose, 10 lb.

Economic Qualities.—This variety of goose is a moderate layer, but is specially characterised by the quality of its flesh, which is spoken of as exceptionally fine in texture and flavour. The Canadian geese are very hardy and quick growers, but, as already indicated, there has been a large infusion of the blood of the wild into that of the ordinary goose; their chief value is for crossing, and as a means of giving fresh vigour to the ordinary races.

Danubian.

History.—The breed to which the term Danubian is applied is sometimes called the Sebastopol goose, and appears to be found more or less over a wide area in South-eastern Europe. Probably the latter term may be explained by the fact that geese of this variety were brought over to this country about the time of the Crimean War by ships returning from the Black Sea. A few specimens have been met with in this country, but I have seen more at continental shows than elsewhere.

Description.—The special characteristic of this breed of geese is that the hind quarters of the bird are covered with loose, shaggy feathers, some of which are long enough to touch the ground. These feathers are sometimes quite or nearly straight, but often have a curl in them which, as is mentioned in our remarks on the feather trade, gives them an increased value. As a rule the plumage is pure white, and when that is the case is regarded as more correct. But I have seen specimens in which grey or light brown patches were to be found. The head and neck are similar to those of the Embden, but they are not so high in front, and give the appearance of a very compact body. Of course, the loose feathers look untidy, and under certain conditions must become very draggled, but upon water this breed appears attractive.

Economic Qualities.—These geese are moderate layers, but are very good sitters and mothers, and the fact of their not having the disposition to roam to the same extent as some varieties is a point in their favour where space is limited or where they would be likely to do harm. They are gentle in temperament, live contentedly with other fowls, and at the same time obtain a large amount of their own support, so that they can be maintained inexpensively. The quality of flesh is not

regarded as being equal to that from our best Western breeds, but upon this point there is a want of direct or reliable evidence. The weight of the adult male is about 10 lb.

Russian.

History.—During a visit recently paid to Russia (May 1899) I came across a breed of geese of which I have never heard before, and which possesses characteristics peculiar to itself. Of it there are two varieties—namely, the Arsamas and the Tula—the former being the more numerous at the St. Petersburg exhibition, and also the larger in size of body. These geese appear to be bred chiefly in the country to the south of Moscow, of which the manufacturing town of Tula is the centre. They are stated to have been bred in Russia for centuries, with the object of using them for fighting, and their structure of head and body is calculated to enable them to do battle effectively. The laws of the country prohibit this sport, but it is evident that even in Russia laws are not always obeyed, and a good deal of this fighting is surreptitiously carried on. I was unable to secure as much information as to this race of geese as I should have wished, at any rate as to their origin, and it is probable that there is very little direct history obtainable.

Description.—These birds are by no means pleasing in appearance, and have a bull-dog type of head which attracts attention, and indicates the use to which they have been put. In the first place the head is very short, and nearly round, with a wide forehead, and well developed cheek muscles. In the older specimens two knobs appear on the top of the skull, with a depression between. The bill, or beak, is very short, and stout at the base, so that the head and beak are together about the same length as the head is deep. The head, in fact, is more like that of a parrot, if the curled tip of beak is omitted, than of a goose, the line from the top of the head to the tip of the beak being nearly straight. From the nostrils the surface of the bill is ribbed, and the colour is pale-yellow, with a tip of ivory. The eye is large, full, in some cases nearly black, and in others grey, or light blue, with eye-lids parchment colour. The neck is short for a goose, strong, and slightly curved. The back is wide, flat and straight, the breast wide, full and round, and the body large and stout. The wings are large, with very strongly developed shoulder muscles. The legs are of medium length, strong, wide apart, and the feet large and round. The plumage is close and compact. The Arsamas variety is pure white in plumage, and the weights

from 15 to 20 lb., whilst the Tula variety is grey in colour, and sometimes clay, the weight in this case being 12 to 15 lb.

Economic Qualities.—As already mentioned, this variety has been bred chiefly for its fighting instincts, and it is stated that the ganders are as keen for battle as a true fighting game-cock. Here we have the same results as are seen in our English Game fowls—namely, that in seeking to develop strength of muscle and of limb, unconsciously the flesh properties were greatly improved. It is well known that no fowl carries so much flesh upon the breast as the Game, in relation to the weight of body, due to the fact that with increase of size in wings there must be a correlative increase in breast muscle, the latter being the motor for the former. It is claimed that this is equally true with regard to the fighting geese of Russia, and from the appearance and depth of body we should be willing to accept this statement. It is found in Russia that the best results are obtained by crossing the Arsamas gander with another breed of goose, such as the Toulouse or Embden, the softer flesh of these latter counteracting that hardness which must result from breeding for fighting purposes. This is our experience with Indian and other Game fowls, and explains the reason why the Indian Game and Dorking cross has proved so valuable. These fighting geese are reported to be only moderate layers, and this I should expect to be the case. It would be very interesting to see trials of the Russian geese made in England, and their great vigour would be an advantage in many strains.

Crosses.

In this country the regulation cross is between the Toulouse and the Embden, and large numbers of these half-breds are to be seen, frequently more often than either of the respective races pure. But, in the great majority of cases, there is no system in the crossing, and we are absolutely without definite information as to the results obtained. The "rule of thumb" is yet more depended upon than scientific observation, and so long as that is so, progress made will be comparatively small. On talking over this question with farmers, I have found that they believe it is wise to introduce different ganders every season or two, but, except that the cross-bred goslings are frequently found to be hardier than those from pure birds, there is no reliable information obtainable as to comparative growth. Fashion or personal fancy has more influence than practical knowledge. In many cases the saving of a little trouble is more potent in selection than securing that which is likely to

give the best results. If one man is seen to have a fine flock of geese, his neighbours will buy ganders from him, it may be without inquiry as to previous history or relationship with birds at present on hand. Such a want of system would be fatal with larger stock, and it is not on these lines that improvement has been secured in our breeds of cattle and other live stock. It ought to be the aim of everyone to breed only from the best, to cross with a clearly defined object, to apply the laws of Nature as far as known. By these means, and by these alone, can improvement be secured, and the work of previous generations confirmed. Of course, the Toulouse and Embden cross, when the breeding stock is properly selected, gives us very fine specimens, both as regards size and quality of flesh. But it appears that, for reasons afterwards explained, the time has arrived when the races of geese kept in this country should be increased, and we should not be content with the two which hitherto have held the field unchallenged. For crossing purposes the introduction of either the African, the Chinese, or the Canadian, and perhaps the Russian—though that must be a matter of experiment—would be valuable.

Unfortunately in this country the opportunities for experimental work as carried out elsewhere have not been afforded. There are many problems in poultry culture awaiting solution, but these are beyond the power of individual breeders. The experimental stations in Canada, the United States, and on the Continent are doing good work, adding considerably to our store of knowledge, but frequently they are more suggestive than directly applicable to our own conditions, and we must conduct these experiments for ourselves. I do not wish to discuss here how so desirable a result could be accomplished, but the need is evident. That need has been again strongly impressed upon me when studying for the purpose of the present article. As the latest contribution to the subject I summarise from the Rhode Island Report previously quoted some results of the crosses made upon the farm at Kingston, Rhode Island.

Embden-African Cross.—Goslings very rapid in growth; very hardy; at ten weeks old headed the list, averaging 9·83 lb. each; exceeded in average weight, as green geese and mature birds, all pure breeds or crosses in 1896; picked easily when killed; very fine in quality; colour, white or pied.

African-Embden Cross.—Goslings followed more closely the type and colour of the African goose, dark in colour, and a majority had black bills, strong and vigorous; in rapidity of growth and average weight little difference; at eight weeks old this cross headed the list; the general grade of birds killed was, in the second class, due to dark feathers and black bills. The shrinkage in dressing greater in these two crosses than some others,

Embden-Brown China Cross.—Goslings grew well and ranked above the average in size; average at ten weeks old, 8·14 lb.; chiefly white or pied with yellow bills; dressed very well, ranking in first class.

Brown China-Embden Cross.—Goslings followed the Embden in colour and shape, chiefly white or pied with yellow bills; rather larger in size than reverse cross; not so good in quality, grading to fourth rank; loss in shrinkage, however, less than with the Embden-African and African-Embden crosses.

Embden-Toulouse Cross.—These proved to be good growers, though not so large as others; at ten weeks they tied with the Africans for fifth place, weighing 8·78 lb.; fattened as green geese they weighed from 10 to 13 lb., and were ranked in the first grade; some of the birds were white or pied, and others almost like pure Toulouse; as mature birds they weighed from 12·5 lb. to 17·3 lb. each.

Toulouse-Embden Cross.—The goslings proved to be good growers, at five weeks averaging 3·19 lb., and ranked seventh in average weight, but at ten weeks they held the second place, weighing 10·03 lb. each; as green geese the average was 12·29 lb.; two of the birds were dark in colour like the Toulouse, and the others white or pied, but all had yellow bills; they were not so good dressed as the reverse cross, though in the first class.

Toulouse-Brown China Cross.—The goslings were strong and hardy, following the Toulouse rather than the Chinese type; in weight they were below the average, averaging at ten weeks 7·98 lb.; as mature geese they averaged 12·07 lb. alive; when dressed they did not grade high on the market.

Brown China-Toulouse Cross.—This was one of the most productive crosses, as the Toulouse are very good layers; goslings very hardy and grew rapidly; at five weeks they headed the list, at eight weeks held the second place, but at ten weeks, when they weighed 9·17 lb., they had dropped to fourth place; as green geese they varied from 10·82 to 12·27 lb.; the heaviest weighing when matured, 19·38 lb.; the market report varied considerably, some ranking in the second grade, and others in the fourth; most of the birds followed the Toulouse type.

African-Toulouse Cross.—In this case the goslings showed the African influence, indicating that the African has greater prepotency than the Chinese; at five weeks old they averaged fifth, at eight and ten weeks old third, the weight at the last-named period being 9·45 lb.; as green geese the average live weight was 12·34 lb., and as mature birds 15·14 lb., the heaviest scaling 18·81 lb.; some of the birds were rather hard to pick; the market report was not high.

Toulouse-African Cross.—The goslings showed a good deal of Toulouse shape, but followed the Africans in colour; at five weeks they held the eighth place, and at eight weeks the fourth, and at ten weeks averaged 8·79 lb.; as green geese they weighed 12·06 lb., and as mature birds 15·50 lb.; in the market they ranked in the third grade; the shrinkage was small.

African-Brown China and *Brown China-African Crosses* were lowest all round.

Embden-White China Cross.—At ten weeks the goslings averaged 8·41 lb. each, as green geese 10·50 lb., and when mature 11·69 lb.; three of the birds were pied and the others white; the market report stated that they were "the best shaped, plumpest, and in every way a little superior to the others."

White China-Embden Cross.—At five weeks the goslings were fourth in average weight, at eight weeks fifth, and at ten weeks they averaged only 7·5 lb.; the green geese averaged 9·01 lb., and as mature birds 10·98 lb.; several of this cross were pied, the others white.

Toulouse-White China Cross.—In the early weeks the goslings ranked fourth, and at ten weeks averaged 9·37 lb.; as green geese they weighed 10·87 lb., and as mature birds 15·94 lb., one scaling 19·56 lb.; the Toulouse influence was much in evidence.

White China-Toulouse Cross.—This was one of the least favourable crosses, as at ten weeks they only averaged 6·63 lb.; as green geese 9·66 lb.; the market report placed them in the lowest grade.

So far as weight is concerned, the evidence given by these figures is largely in favour of what may be termed standard breeds, either pure or crossed. But in quality, which is after all of greater importance, the following stand in the first three grades:

First Grade:	Embden-White China (best).
	Embden-African.
	Embden-Brown China.
	Toulouse-Embden.
Second Grade:	Embden-Toulouse.
	African-Embden.
	White China-Embden.
	Brown China-Toulouse.
	Toulouse-White China.
Third Grade:	African-White China.

Thus it will be observed that the introduction of the African and the Chinese has given the best results in this interesting series of experiments, and the use of these two types of geese is to be recommended for the improvement of British stocks. But it is equally true that with them the Embden for crossing purposes gives the best results.

Demand for Geese.

In connection with the goose industry it is necessary for us now to consider what is the present state of the demand, for it has been evident during the last few years that the inquiry for geese has been decreasing, due to changes in taste or fashion much more than to increase of foreign supplies. The latter undoubtedly have affected prices, but with reduction therein we might have expected an increased demand. Such, however, is not the case, and the change is one which must be recognised. We may, to some extent, influence prices, but it is a more difficult task to stem the tide of fashion in such a direction as this. In order to learn what is the present condition of things in the goose trade, I addressed myself to a few leading traders,

both in London and the provinces, and their replies are summarised below.

Messrs. Brooke Bros., the Central Markets, Smithfield, inform me that the demand for geese is not so great as formerly, and prices are lower. Ten years ago good foreign geese made 8*d.* per pound, now 7*d.* is the top price. Most of the French geese are very gross,[1] and the wiser folk find them unprofitable, preferring the turkey, in which there is much less waste. There is, however, always a large demand for geese at Christmas, but chiefly from the poorer class, though birds of extra good quality still sell well. Six to ten shillings is about the price for geese. The Michaelmas trade is not so good as was once the case. Messrs. Brooke suggest that the change noted is probably less seen in the industrial centres than in London. They further report that there is not now much difference in price for English and French geese, and sometimes foreign geese are better than those produced at home, those sent from Normandy being the best of supplies from abroad.

Messrs. G. & R. G. Bagshaw, of St. Miles, Norwich, who have been in this trade for a long period, write:

> The demand for geese is most decidedly not so great now as in former years. Both Michaelmas and Christmas demand has greatly fallen off. The prices for home-grown birds are not so good as formerly. Some 35 years since we used to have about 2,000 geese for Michaelmas and 10,000 for Christmas; the Michaelmas geese would make 7*s.* to 6*s.* each, and the Christmas geese rather more. We used to buy them principally from Ireland, Holland and Germany, and fat them here. At that time the custom of having a goose for dinner on Michaelmas Day was far more prevalent than it is to-day, hence the falling off in demand. At Christmas there were very large goose clubs in London and all the principal large towns. Within the last 27 years we supplied a public-house in Birmingham (in one consignment) with 999 geese for a Christmas club. Whether that house supplied any smaller houses we are not sure, but we believe not. The clubs have almost entirely ceased to exist, we believe mainly owing to labour disturbances or its unsettled state, and, later on, further affected by licensing laws. There are no Irish geese fed in this district now, and comparatively few Dutch or German. The local rearing is also on a more limited scale, but still sufficient to supply all local demand, and it is risky to attempt to rear for the larger centres as they are so frequently glutted with foreign supplies, which are compelled to be sold at less money than an English farmer in this district, or we believe any other, could rear them. Excessive railway charges have also been a great hindrance to this trade. In 1884 the rate for dead poultry from France (Honfleur and St. Malo) to Manchester was 57*s.* 6*d.* per ton, from Norwich to Manchester 60*s.* per ton, and consignments under 5 cwt. averaged quite 80*s.* per ton, and similar rates undoubtedly applied to other large centres.

[1] I think this remark applies to such as come on our markets, and certainly they are gross and greasy, but I have seen in Normandy beautifully finished geese being prepared for Paris; they were, however, too high in price for our trade.—E. B.

Messrs. Carter, Stoffell & Fortt, Ltd., of Bath, Clifton, and Dorchester, say:

The demand is not nearly so great as in former years. The sale of Michaelmas geese gets less year by year. Fewer geese also are sold at Christmas, but the demand has certainly not been changed from Christmas to Michaelmas. Formerly good home-grown birds could easily command 9*d.* and 10*d.* per lb. wholesale; now that is the top price retail, and it is rare for the wholesale prices to exceed 7*d.* or 8*d.* English geese still hold their own as regards quality, although French and Normandy run them closely and practically fetch (on the market) as much money. Irish fatted geese, although good, never come to market in such good condition as English. Austrian geese eat rather strong and are much smaller than the home-grown birds (though they are very plump), and being small they can be sold retail at 5*s.* each, and at that price meet a fair demand, a demand which cannot be met from English sources. Large fatted geese are a thing of the past, and only sell for show; the demand is now for small or medium sized geese, well fed and with fine grained flesh. After New Year's Day there is no demand for geese till Michaelmas comes round again.

Messrs. Muirhead & Sons, of 20 Victoria Street, Manchester, state:

They do not consider the demand to be as great as in former years. There is certainly a demand for goslings at Michaelmas, but a falling-off has occurred at Christmas. The prices for home-grown birds are about the same as formerly. English geese are far better in quality than foreign birds. Their opinion is that the public has discovered that a turkey is more profitable than a goose; a far greater proportion of flesh is on a turkey than a goose, and they consider this in a great measure accounts for the falling-off in the demand.

Messrs. Neale & West, of Hope Street, Cardiff, write:

The demand for geese is not quite so large. Turkeys are increasing in demand. The principal demand here is about Christmas. Price has a downward tendency, owing to the large foreign importations, and the excellent condition in which they arrive. The English fetch a better price, although there is not a lot of difference in the quality. It is more because they *are* English. The worst geese come from Ireland, and the way in which they are prepared for market is a disgrace.

Mr. Joseph Burton, of 11 Smithy Row, Nottingham, gives a rather different view, so far as the North-Midlands are concerned, in the midst of a large industrial district. He informs me that:

As far as his experience goes, extending over 17 years, demand is better. There is a fair demand at Michaelmas, but better at Christmas, and also in the New Year, than formerly. According to condition of the birds, supply and demand, &c., the farmers in this district get from 6*d.* to 7½*d.* per lb. English birds if in good flesh, although perhaps lacking in the "finish" of some Continental and best Irish birds, are more solid and economical in use, and even at more per lb. are to the consumer a cheaper article. Many growers are greatly lacking in the knowledge of "finish"—namely, giving the birds when well-meated a more marketable and attractive appearance,

in regard to colour more particularly. Many birds dress out dark or ruddy in appearance, thereby repelling instead of inviting the purchaser.

Messrs. Timothy Newby & Sons, of Boar Lane, Leeds, also take a different view of the case from that of the majority, and say:

> With us the demand is greater both at Christmas and Michaelmas. We are selling more than in former years. The prices are not so good owing to the competition of foreign. With us the demand is for English, which are much preferred. We think that if a good quality English gosling were brought into the market early in the season, it would soon create a much larger demand.

IMPORTS.

So far as foreign supplies are concerned, numbers of dead birds come to us every year from abroad—Germany, France, and Canada being the countries which send the greatest number. It is impossible, however, to obtain any reliable statistics showing the relative quantities of various kinds of poultry imported, as all are lumped together. For instance, two years ago last December the total weight of dead poultry landed at Newhaven and Southampton in the ten days prior to Christmas amounted to 2,696 tons, chiefly geese and turkeys, but there is no means of learning how much of each. But about ten days before Christmas I was at Le Mans, and one morning a dealer left that city for London with ten railway waggon loads of geese alone. The falling prices have considerably reduced the trade, and last December, according to the figures given me by the London, Brighton and South Coast and the London and South Western Railway Companies, the total weight landed at the two ports named had fallen to 1,241 tons, or less than half the quantity received in 1896. But I am inclined to think that there has been some deviation of the traffic, for, according to Mr. Consul Gurney, formerly at Cherbourg, considerable quantities are being shipped from Normandy ports direct to Liverpool, so that the reduction may not be so great as these figures would otherwise show. But I have not been able to secure reliable statistics. In any case they would apply to poultry generally, and not to geese in particular.

LIVE GEESE.

A considerable trade is done in live geese, which are brought over to Britain from Ireland and the Continent in the latter part of the summer, but the evidence is that it has fallen off during the last decade. In many parts of England and Scotland

it is a common sight during August and September to see droves of young geese offered for sale, and farmers buy for feeding off. At one time goose feeders went over to Rotterdam and other West European ports to buy from the German collectors, but that is not so common a practice, and sellers have to seek the buyers rather than the reverse. I have endeavoured to estimate the quantities of lean geese received in this way, but without success. For instance, Sillóth, Cumberland, is one of the ports where large quantities are received, especially intended for Cumberland, Northumberland, and the South of Scotland, but I am informed that the different descriptions of fowls are not stated on the invoices from Ireland, and that the crates often contain geese, ducks, and other poultry. The following, therefore, only touch a small part of the trade :

Live geese landed in 1898.

	No.
Fleetwood	5,070
Barrow	2,234

As indicating one of the systems adopted abroad, I may summarise a very interesting article which appeared some time ago in one of the poultry journals,[1] giving an account of the goose industry in Eastern Germany and Western Russia.

In the months of June, July, and August, cattle dealers find the trade in young geese sufficiently lucrative to abandon their usual occupation, and devote their time to, and invest their money in, goslings, which they bring from Russia in thousands. Goslings are also bred in very large numbers in Poland and East Prussia, and that is the reason that this class of poultry can be procured at very low prices; but this depends to a great degree on the season and management of the breeding stock in the spring. If the weather is fine and warm during the early months of spring, there is always a good supply of fine well-grown goslings; but if the early part of the breeding season is cold and wet, thousands die of starvation. So that when the dealers go their rounds with a view of purchasing they find only very young and weakly birds, many of which die on their journey to the place of destination. In favourable seasons the goslings have arrived at the age of about four months, and weigh from 7 lb. to 9 lb. before the dealers appear on the scene, by which time they realise about 2*s.* each, sometimes less; they are then able to withstand what we in England should term a long journey; in Germany and Russia a three days' journey is not considered a long one. When a dealer has purchased and brought to some particular centre a flock, say, of 2,000 goslings, he makes arrangements with the station master of the nearest station for loading his living freight, so that no interruption can interfere during the transport. So great is the traffic in live geese and other classes of poultry during the months of June, July, and August, that whole trains are laden with feathered stock, which run much quicker than ordinary goods trains. Consequently, the feathered folk seldom travel more than three days into the destination country. There

[1] *Stock-keeper*, March 29, 1895.

arrived, our goose king finds on the station his assistants and several dogs, in order to keep his white regiment well together.

Before the march begins the birds are allowed to rest for a few hours, are fed and watered, and all the weakly ones left in charge of an attendant; after which the order to march "forward" is given, and what with the cackle of the geese and the barking of the dogs, the noise is something alarming to anyone not accustomed to such an uproar. The sale of the birds commences with the order to march into the farming country, as the birds are too thin in flesh to offer to shopkeepers during the months of July and August. Therefore only farmers can be taken into consideration as buyers.

Nearly every goose dealer is also a cattle dealer, and is well known in the districts in which he offers his goslings for sale. In many instances the dealer has already made arrangements for the disposal of the bulk of the birds he has purchased, consequently the whole of his huge flock is disposed of within the space of four or five days, and from what outsiders can learn, there seems to be a profit of about one shilling each, but this is by no means the case. Our correspondent, who is "well in the know," assures us that if a dealer were to import 2,000 goslings from the producing countries, and dispose of them in the farming districts in Germany, he would not in reality have sold more than 500, the remaining 1,500 being left at various farms at the price of 2*s.* each; these were not sold, but simply left with the farmers to feed, the 2*s.* each being a guarantee against absolute loss.

The interested farmer then fills up a contract to feed and pasture for a term of three months the number of goslings he has taken charge of. In the beginning of October the goose dealer reappears at the various farms, and pays back to each farmer about 3*s.* 6*d.* each for every living bird, this leaving the feeder 1*s.* 6*d.* for the maintenance of each bird for the three months he has had him in his possession; by which time the birds weigh from 12 lb. to 15 lb. each. During the process of collecting the flock together again, the dealer announces his intention to be in the cattle market in Berlin on or about a given date, where he finds ready purchasers at good prices; these geese are called "roast geese" and seldom weigh more than 15 lb. each.

Feathers.

Ere the days of steel pens the production of quills was an important industry, especially in Eastern England, and it is probable that more attention was paid to these than the other classes of feathers. The total bulk of feathers even now produced from all classes of fowls in England must be considerable, but it scarcely enters into trade considerations. Probably, in many cases, the breeders use such feathers as they obtain for their own purposes, as it takes a good many birds to supply material for a well-filled feather bed. But it is not too much to say that a great bulk of this useful section of poultry products is absolutely wasted. Abroad, where money is less plentiful, the little items of income receive more attention. From Russia alone the exports of down and feathers in 1898 were, in value, upwards of a quarter of a million pounds sterling. I believe that the system of regularly plucking the birds for their

feathers is practised in several European countries, and we have no wish to see it reintroduced here. The best feathers known in the trade are the Danzic grey, coming from Eastern Europe, though supplies are received from all parts of the Continent of Europe. The Danzic grey are very soft, such as are obtained from young birds, giving credence to the suggestion that they are secured by plucking the geese when alive, and are curled, the advantage of which is that a much smaller number will serve the same purpose than if they were flat, and as they have a natural spring in them, there is not the same danger of matting in the bed, pillow, or cushion. Whether this curl is natural, in which case we find an explanation why Danubian geese are bred in South-eastern Europe, or artificial, is uncertain. When plucked from living geese they can be sorted into their respective qualities, otherwise this has to be done by hand, which is a tedious and expensive process. Complaint is made that our farmers and poultry fatteners do not sort the feathers, take no care of them, and send them forward in dirty condition, so that their value is greatly depreciated, entailing an amount of trouble to the merchants which is avoided with the foreign supplies. This is a point which deserves attention, and though the feather trade will never be a very large one in this country, if proper attention were given it would conduce to greater profit than at present. In Sussex it is calculated that the feathers obtained from a fowl should pay the cost of killing and plucking, and this would be equally true with larger birds if care were taken to deal with them in the right manner.

As affording information as to the best method of preserving feathers, I quote the following from a French source [1]:

> The feathers are naturally coated with a ceruminous fatty substance, intended to protect the birds against dampness. The goose on leaving the water does not seem wet, and it is not; besides, their shafts are filled with lymphatic juices. This substance and these juices are subject to fermentation, and if not properly dried they would acquire a bad odour and become spoiled. They must then be dried, either by placing them in large rooms, or, more simply, by putting them into sacks, without pressing them together too much, and then drying them in the oven. This last operation destroys more surely the living insects, lice, and their eggs, and dries sufficiently the cerumen and juices to prevent further fermentation. The operation of drying can be repeated. To give the down a durability, so to speak, indefinite, it must be subjected to other operations; these consist in lightly beating and shaking it, to remove the dust from the dry cerumen, and especially from that of the pellucid membranes surrounding the shafts of the feathers. When well dried there is no more dust, and the feathers last for ages.

---

[1] *Guide pratique de l'Education lucrative des Oies et des Canards.*

Economies in Feeding.

From what has been stated it will be evident that the present tendency is for prices of geese to decline. Hence the question of cost in production is very important, and it is desirable that the goose rearer should consider this point, for, if he can reduce the same, he is in a much better position to meet the altered conditions. During the last generation there has been an increasing disposition to highly feed all animals, and in some directions it is conducive to the greater profit. But it is not always so, and it is essential to regard possible returns in relation to expense of production. In the case of geese a mistake has probably been made in feeding too much grain and meal, for these birds are by nature grass eaters, the serrated edges of both mandibles of the beak, and the rough covering of the tongue, indicating that they can graze as ruminants. From the earliest period of their existence grass should be the staple food, and it is for this reason that they are produced most cheaply in the open districts, where this class of food is plentiful, and they can wander about without restriction in search thereof.

During an ordinary summer in these western islands, and especially in the moister districts, there is plenty of feed, and very little is necessary for geese in the direction of an artificial diet. In fact, geese thrive much better living entirely upon green stuff than if they are restricted to grain and meal, whilst the difference in cost of production is very great. Hence in hilly districts, where the rainfall is usually greater than on the flatter lands, and in the fen counties, we find that grass grows when it is burnt up elsewhere. Goose farmers must apply the same principles as do the sheep farmers, namely, consider the question of "feed" available when determining what amount of stock can be maintained. Upon this point I might enlarge at considerable length, but it is scarcely necessary to do so. Of course, in arable districts substitutes can be found in the way of growing crops for this purpose, almost any kind of green fodder being suitable, the best of all being oats eaten off when the blades are about a foot above ground. But this is a more expensive system than if the birds are feeding upon open land. In a very dry season, when feed is scarce, roots or steamed hay may be employed, but they are only substitutes, and are not of the same value as fresh young grass. The old birds must have artificial feeding during the winter season, in the same way as other stock, but not nearly to the extent usually thought desirable, as it is better to have the birds in lean condition at the beginning of the breeding season.

Feeding-Off.

When grown well during the summer, geese put on flesh very rapidly, and well repay the cost of food supplied to them. It is customary in all the geese-rearing districts for rearing and feeding-off to form two distinct industries. There are many farmers who rear goslings, but, as a rule, they prefer to buy them after harvest, and put them out on the stubbles or roots. For autumn geese this system brings the birds into excellent condition, and the cost of production is much less than when they are fed up for the Christmas markets. Hence they can be sold profitably at a much lower figure, and I am inclined to think that feeders would do well to give special attention to this season for disposing of their birds, the turkey not being so much in competition as is the case two or three months later. Autumn geese are not so luscious as those met with at Christmas, and the consumer might be educated to ask for them at that period.

The old writer previously quoted, Gervase Markham, in his *English Husbandman*, described the method adopted in the seventeenth century as follows:

> After a gosling is a month or six weeks old you may put it up to feed for a greene Goose, and it will be perfectly fed in another month following: and to feed them there is no meat better than slegge Oates, boyl'd and given plenty thereof twice a day, Morning, Noone and Night, with good store of Milke or Milke and Water to drinke. . . . Now for the fattening of elder Geese which are those which are five or six months old, you shall understand that after they have been in the stubble fields, and during the time of harvest got into good flesh, you shall then chuse out such Geese as you will feede, and put them in severall pennes which are close and dark, and there feede them thrice a day with good store of Oates, or spelted Beannes, and give them to drinke water and barley-meale mixt together, which must evermore stand before them; this will in three weekes feede a Goose so fatte as it is needful.

The system now adopted of feeding-off is not very different from that here described. During the last three weeks the geese should be confined in sheds or pens, about twenty or twenty-five in a batch. The place selected for this purpose should be roomy and well ventilated, but must not be very cold or subject to great variations of temperature, or the flesh development will be retarded considerably. An excellent plan is to have a range of pens, each with an open forecourt, either around three or four sides of a square, or along one side, and to allow each batch out in turn for feeding, during which time the pens can be cleaned out. The advantage of the square arrangement is that they are more sheltered from wind and rain. Each batch should be killed at the same time, and thus it is better when putting

up, to grade according to the respective sizes of the various specimens. If a few are taken out of a batch those remaining are liable to fret and lose flesh. For feeding off the grains most suitable are oats, either whole or crushed. Barley meal, mixed with brewers' grains and potatoes, are excellent for this purpose, but oats steeped or simply thrown into water produce the finest quality of flesh, possessing firmness without hardness. Beans and peas should be avoided, as they make the flesh hard. Indian corn is frequently employed, either whole or ground, and there can be no question that it gives weight and bulk, but the result is unsatisfactory, in that the body and intestines are charged with a large amount of yellow, oily fat, which runs away into the dripping tin when the bird is cooked. Moreover, the appearance of a maize-fed specimen is never so pleasing as when oats are employed.

Killing and Dressing.

When the goose has been sufficiently fatted, either upon the stubbles or roots, or in the pens, it should be starved for from twelve to eighteen hours. Killing is best accomplished by piercing the brain with a knife. It is better to tie the legs to prevent the bird struggling. It should be held up by the legs, and if struck a smart blow with a stick at the back of the head it is thereby rendered unconscious. Now hold the bird between the knees, the head grasped in the left hand, and insert the knife, which must have a sharp narrow blade, in the hollow place without any bone to protect it at the base of the skull, just where the head is joined to the neck, and press through to the brain. If properly accomplished one of the chief arteries is severed, and the bird quickly and painlessly bleeds to death. Plucking is better done at once, and an expert operator can do this very speedily. Some pluckers dust a little powdered resin among the feathers or on the hand to give a firmer grip. In no circumstances should the bird be dipped in hot water, unless it is to be cooked at once. The doing so undoubtedly causes the feathers to come out more easily, but if the bird is to be marketed, a flabby appearance is given to the skin which reduces its value. Birds should always be killed twenty-four hours before they are sent away.

The method of trussing is as follows[1]: 'After plucking the goose, it must be carefully singed, drawn, and wiped out with a damp cloth. Then cut off the neck as near the back as can be

[1] *Poultry Keeping as an Industry for Farmers and Cottagers*, by Edward Brown, F.L.S. pp. 101–2.

done, leaving the skin long enough to draw over the stump. Next cut off the feet at the first joint, and do the same with the wing pinions. To make the bird look plump, press in the breast-bone, and run a small skewer through the lower part of each wing. Now draw up the legs, and skewer them through the centre, into the body; when this is done, two small skewers are needed to complete operations by fixing the shank of each leg to the shank-bones. It is now in proper shape for the spit, the only thing that requires doing being to cut off the vent and make a hole large enough to pass the rump through, in order to keep in the seasoning when served at table. The goose should now be laid upon a stone or marble slab, and if the dressing has been done shortly after killing, it will be necessary to allow it to stiffen and cool before packing for market. To improve the colour of the flesh, it is a good plan to wrap it in a cloth which has been dipped in old milk, and afterwards wrung nearly dry. . . . The giblets must not be overlooked. These delicacies should be put on one side, together with the liver and gizzard, and sent along with the geese to the poulterers.'

Diseases of Geese.

There are some diseases to which geese appear to be specially liable, and a few words on this subject may be helpful to breeders of these fowls.

Lameness in Goslings.—Some time ago I found in a district of the North Riding of Yorkshire, where geese are kept to a large extent, that breeders were troubled with a peculiar disease among the goslings, namely that the young birds when about three weeks old began to grow lame in one leg and to gradually pine away. This affection does not appear to be met with every year, or is confined to a few breeders, but when it makes its appearance is very prevalent. So far as could be learnt it is not due to neglect or bad management. On further inquiry it was found to appear in dry seasons, especially when east winds and frosty nights are experienced, and the evidences are that it is really a lung trouble aggravated by an excessively dry situation. The remedy most suitable is to remove the birds to a sheltered run in a low situation. As a preventive it is desirable to see that the stamina of the race is maintained by avoiding close breeding, and not using too young geese for breeding.

Loose Mandible.[1]—One deformity to which adult geese are

[1] For this and the following note I am indebted to Mr. D. Bragg, Aikton, Wigton, well-known as one of our leading breeders and judges of geese.

liable is a looseness under the lower mandible, which allows the tongue to drop down to such an extent that the goose soon becomes unable to feed, and eventually dies from starvation. This is quite distinct from the loose skin at the throat of the Toulouse, which is called the gullet, a distinctive point of excellence in the Toulouse variety. Singular to say the heavier-gulleted geese are less liable to this tongue-dropping than smaller-gulleted ones. At the same time the deformity is not so prevalent with the Embden variety, which naturally are clean cut and tight in throat. In cross-bred and common geese this trouble seldom occurs. We have no doubt, however, that the deformity arises from such causes as breeding for large size, loose skin, forced feeding, in-breeding, and thereby weakened constitutions. A simple operation is necessary to effect a cure, and to save the goose from pining and death. It is also better to operate early, otherwise the skin under the tongue becomes charged with sand and grit which cause rapid development of the trouble. To operate, draw down the outside skin of the lower mandible with the finger and thumb. There is no difficulty with pressure in separating this skin entirely from the inner membrane. With scissors cut off the drawing skin to the extent of about one inch in length, and with a bent surgical needle and silk draw the edges of the skin together over the wound, tight enough to support the tongue, and the operation is complete. We have always been successful with one operation, and never found it necessary to repeat on the same subject. Immediately after the operation the goose will be able to enjoy food and water without the least inconvenience. The life of many a valuable goose has been saved since we first introduced this simple operation.

Loose Wing.—What is called loose wing in goslings and geese may arise from constitutional weakness, but is often induced by liberal feeding and rapid growth up to the time of feathering. It occasionally happens that at this time, when the flight feathers are from one or more inches in length, they are so heavily charged with blood and sap that the gosling is unable to tuck up or retain in the natural position the pinion joint. Consequently the joint inclines outward. If it is not supported and does not receive prompt attention, this will cause the gosling to have a permanently slipped or twisted wing. In these circumstances the joint and flights require temporary support with soft string, the fixing of which is somewhat difficult to describe, but is really very simple in practice. Soft string, or better still narrow tape, is firmly knotted around the wing-butt, below the joint. This being the smaller part of the wing it is

not likely to slip off. One end of the knotted string is then carried within an inch or two from the end of the pinion (the weak portion), where it is again loosely knotted and the string continued over the inside of the shoulder, and tied to the other end of the string at the first knot, previous to which the weak-wing end is drawn rather above its natural position, and must remain so for about a week. This tying may occasionally have to be repeated.

Conclusion.

It will be evident from what has been stated that:

First.—Goose-breeding has been found more profitable in and suitable to the grazing than the corn-growing districts, but that with the greater amount of land laid down to grass there has not been any relative increase in the number of geese kept. Probably the reduction of area devoted to corn, and the increase of size in farms, has reduced the inquiry for geese in the autumn on the part of farmers, with the view of feeding them off. And the enclosure of open and common land has accentuated this decrease.

Secondly.—There is an important reduction in the demand for geese, due to changes in the taste, and increase in the purchasing power of large sections of the population. This is more evident in some districts than in others. And the influx of foreign supplies has reduced prices.

It is only necessary to consider whether there is any possibility of bringing about a revival of this trade, and, if so, by what means. We must recognise that the day of big birds is over. They were only required at special seasons, such as Christmas, and the demand for them has fallen off to a considerable extent. I venture to submit that were smaller birds produced (and there is no reason why they should not be as profitable as the larger) these would be bought more readily, and it would be possible to create a desire for them on the part of the consuming public. A fleshy, compact, good bird of 8 lb. to 10 lb. would be finer in meat qualities, and, during the "green geese" and autumn seasons, would meet an inquiry which might grow to a very large extent, touching a class which at present does not enjoy the luxury of this fowl. I have tried to indicate the class of geese which, either pure or crossed, would be most suitable to provide such a trade as is here indicated, and breeders would do well to introduce them. In France it is customary to cut up geese and sell the various sections separately, which plan might be adopted with advantage by poulterers, who would thus create a new branch of their trade—that is, among

families to whom a whole goose is beyond their requirements. There are many parts of the country where geese rearing could be carried out on a much wider scale than is now the case, and if the birds were fed off on the stubbles and marketed immediately, they could be produced at less cost, and thus meet the lower prices, leaving a wider margin of profit than is possible when fed up for the Christmas markets. With advancing demand we should probably find a steady increase in rates at which they sell. Greater care of the feathers would assist the producer, who, unfortunately, does not appear to realise the possibilities in this direction.

EDWARD BROWN.

The Chestnuts, Theale, Berks.

STILTON CHEESE.

THE manufacture of Stilton cheese, unlike the Cheddar and Cheshire cheese-making industries, which can be traced back for several centuries, is of comparatively modern origin. When in 1790 William Marshall published his "Rural Economy of the Midland Counties," he devoted some attention to Stilton cheese. His account of it is as follows:—

> Leicestershire is, at present, celebrated for its "cream cheese," known by the name of "Stilton Cheese." This species of cheese may be said to be a modern produce of the Midland District. Mrs. Paulet of Wimondham, in the Melton quarter of Leicestershire, the first maker of Stilton cheese, is still living. Mrs. Paulet being a relation or an acquaintance of the well-known Cooper Thornhill, who formerly kept the Bell at Stilton (in Huntingdonshire, on the great north road from London to Edinburgh), furnished his house with cream cheese, which, being of a singularly fine quality, was coveted by his customers; and through the assistance of Mrs. Paulet his customers were gratified, at the expense of half-a-crown a pound, with cream cheese of a superior quality; but of what country was not publicly known; hence it obtained, of course, the name of Stilton cheese.
>
> At length, however, the place of produce was discovered, and the art of producing it learnt by other dairywomen of the neighbourhood. Dalby first took the lead; but it is now made in almost every village in that quarter of Leicestershire, as well as in the neighbouring villages of Rutlandshire. Many tons are made every year; Dalby is said to pay its rent with this produce only. Thus, from a mere circumstance, the produce of an extent of country is changed, and in this case very profitably.
>
> The sale is no longer confined to Stilton; every innkeeper within fifteen or twenty miles of the district of manufacture is a dealer in Stilton cheese. The price, at present, tenpence a pound to the

maker, and a shilling to the consumer, who takes it at the maker's weight. Cream cheese being an article of luxury merely, and a species of produce which cannot become of general utility to agriculture, the art of making it does not come within the plan of this work. (Vol. i. pp. 355–357.)

Very possibly Marshall had failed to learn the somewhat jealously guarded secret of its manufacture. Four years later John Monk, who was sent down to survey Leicestershire for the Board of Agriculture, wrote:—

Stilton cheese is made in most of the villages round Melton Mowbray; but I found it impossible to get at the *secret* of making it from the dairy people; and, from the conversation I had with one of the first managers, I should suppose two cheeses were never made alike, as it depends upon soil, herbage, seasons, heat, cold, wet, dry, &c.

It was only by "the politeness and attention of Major Cheselden, of Somerby, who, upon my acquainting him with my disappointment, kindly undertook to procure it for me from one of his tenants," that Monk was able to obtain a detailed account of the manufacture of Stilton cheese. This runs as follows (p. 43):—

Take the night's cream and put it to the morning's new milk, with the rennet; when the curd is come, it is not to be broke, as is done with other cheeses, but take it out with a soil-dish altogether, and place it in a sieve to drain gradually; and, as it drains, keep gradually pressing it till it becomes firm and dry; then place it in a wooden hoop; afterwards to be kept dry on boards, turned frequently, with cloth binders round it, which are to be tightened as occasion requires.

N.B. The dairymaid must not be disheartened if she does not succeed perfectly in her first attempt.

In 1809 a fuller "Survey of Leicestershire," by William Pitt, of Wolverhampton, was published. A much more elaborate recipe than that procured by Monk was given, together with some details as to the price of Stilton cheese (between 1*s.* and 1*s.* 2*d.* per lb.). The directions are:—

Take the milk of seven cows and the cream of the same number; heat a gallon of water scalding hot, and pour it upon three or four handfuls of marigold flowers that have been bruised a little; then strain it into a tub to your milk, and put some rennet to it, but not too much, to make it hard; put the curd into a sieve to drain; it must not be broke at all, but as the whey runs from it tie it up in a cloth, and let it stand half an hour or more; then pour cold water upon it enough to cover it, and let it stand half an hour or more. Then put half of it into a vat six inches deep, and break the top of it a little to make it join with the other; then put the other half to it, and lay a half hundredweight upon it, and let it stand half an hour; then turn it and put it into the press, and turn it into clean

cloths every hour the day it is made; the next morning salt it and let it lie in salt a night and a day; keep it swathed tight till it begins to dry and coat, and keep it covered with a dry cloth a great while. The best time to make it is in August (p. 159, edit. 1813).

The account given above of the origin of Stilton cheese is corroborated by Nichols in his "History and Antiquities of the County of Leicester." Nichols gives exact dates:—

> It began to be made here (i.e. at Little Dalby, in Leicestershire) by Mrs. Orton about the year 1730 in small quantities, for at first it was supposed that it could only be made from the milk of the cows which fed in one close, now called Orton's Close, but this was afterwards found to be an error. In 1756 it was made only by three persons, and that in small quantities, but it is now made not only from one, but from almost every close in this parish, and in many of the neighbouring ones.

This tradition, that Stilton cheese was originally made in Leicestershire and received its name because it was first made known and sold to the general public at Stilton, was not universally accepted. At the beginning of this century there was a local tradition prevalent in the village of Stilton that the cheese had been originally manufactured as well as sold there until, "wanting more than could be had at Stilton, and knowing that Leicestershire produced excellent milk, and having relations in that county, he (Mr. Thornhill) sent a person to them to instruct them in the mode of making it."

This was supported by the story that "a very old man who died about the year 1777, aged about eighty years, remembered very well, when a boy, that he, his brothers and sisters . . . (were) sent about to collect all the cream in the neighbouring villages for the making of what is called Stilton cheese." (Parkinson's "Survey of Huntingdon," 1813, p. 232.)

In 1878, in the Journal of the Royal Agricultural Society of England (2nd series, vol. xiv.), Mr. J. C. Morton mentions the manufacture of Stilton cheese in his paper on "Dairy Farming." He describes it as made from milk enriched by the addition of cream.

In 1881, in the Journal of the Royal Agricultural Society of England (2nd series, vol. xvii.), Mr. George Gibbons, in his "Report on Cheese-making in Derbyshire," gives a long description of the making of Stilton cheese as practised at Etwall.

In 1885, Mr. James Long, in a book entitled "British Dairy Farming," gives a short account of Stilton cheese making. He states that the system employed is kept very close, and emphasizes the great importance of a constant and precise regulation of the temperature.

In 1889 there is a report in the Journal of the Royal Agricultural Society of England (2nd series, vol. xxv.), by Mr. G. Kemp, on "The Practice of Stilton Cheese Making," in which he states that a true Stilton is not made from unskimmed milk only, but has a certain amount of cream added to it.

Mr. John Oliver, in his book on "Milk, Cheese, and Butter," published in 1894, devotes a chapter to Stilton cheese. He states: "The material is either whole milk only, or this with extra cream in varying proportions. The cheese made its fame with the latter, the highest proportion of fat allowed to it being given by mixing the cream of the night's milk with the whole milk of the morning—an increase of from 30 to 45 per cent., according to the average size of the globules and the condition of creaming."

In No. 93, Vol. VIII., of *The Dairy* there is an article entitled "Stilton Cheese, and how to make it," by Mr. John Benson, late chief instructor of the Midland Dairy School. I have received permission from the Editor of *The Dairy* and from Mr. John Benson to quote from this article, which is well worth the attention of the student.

Inquiries as to the practical value of the information afforded by the above mentioned writers have elicited the fact that by some modern makers at any rate they are not considered of much practical use, though Mr. John Benson, Mr. George Gibbons, and Mr. James Long are considered three of the authorities on cheese-making in the United Kingdom.

The method of making, as adopted at the different Dairy Institutes, which are under the supervision of some of the leading dairy authorities in the Kingdom, has also been criticised.

After consideration, the Journal Committee requested me to visit the Stilton district, in order to report on the present method of making Stilton cheese. I was advised to put myself in communication with Mr. Henry Morris of Saxelby, and Mr. Joseph Rigby of South Croxton, both of whom very kindly promised to drive me round different districts, and to introduce me to some of the leading makers. My information has been obtained during two visits to Leicestershire, in London and Reading, and from correspondence with people who make Stilton cheese in various parts of England and Wales.

My first three days' visit took place in glorious weather. Nothing could exceed the kindness and hospitality of my hosts and their wives. Mr. Morris showed me the dairies which are under his management, and drove me round to several of the leading

dairies in the neighbourhood of Harby and Stathern. Mr. Joseph Rigby drove me round the Beeby and Syston districts, and finally showed me his own dairy.

As Commissioner from the Royal Agricultural Society, I was received with the utmost courtesy wherever I called. I explained that I had come to obtain information on the making of Stilton cheese, and that I should consider all communications private. In consequence, my questions were answered in the fullest manner. At every farmhouse I was shown over all the rooms used for cheese-making, and was allowed to sample several cheeses. I was much struck with the knowledge of cheese-making displayed by the husbands as well as the wives.

Champion Silver Cups, Medals, and Prize Cards obtained at our large shows were a proof that I had come to the right people to give me information in Stilton cheese making. In the houses, old oak such as would delight the heart of the collector was quite a common thing. A steeplechase cup, foxes' masks with the dates of well-known runs, and a rough fox terrier or two of the right sort, showed that business could be well combined with sport. I was glad to hear from the farmers in the district that compensation is paid for damage done by the different Hunts, and that men are promptly sent with posts and rails to repair any gaps that have been made when hounds run over a farm.

Almost every farm had its poultry hut in the fields, and many had artificial mounds for rabbits to burrow in. The grass land looked to be in very good order.

Fences were well kept, and Shorthorn cows of a useful class were enjoying the sunshine in the fields. I was informed that during the spring the large farmers give their cows some mangels and cake, but the smaller ones do not. During the summer a few farmers give a little cake, but in the majority of cases the cows only get grass. Some of the houses were very old and picturesque, with buildings to match. The rooms inside were comfortably furnished, and led me to form the conclusion that farming in Leicestershire must be a paying business.

Taken as a whole, the rooms used in the manufacture and storage of cheese were not very convenient. From conversations I had, however, I gathered that new buildings require to get seasoned before fine cheeses can be made in them, and so farmers' wives prefer to suffer slight inconveniences in the old rooms rather than risk a possible loss in new ones.

As my visit of inspection went on, it became more and more evident that the task that I had entered upon was a most difficult one. Every cheese-maker seemed to work on

different lines, and I was unable to find any two cases where all the details were carried out in the same manner. Whether the dairy and the buildings for the manufacture of the cheese were convenient and well fitted up, or were inconvenient and made the most of, the fact remains that, owing to the skill and attention of each maker, at all the different dairies I visited I tasted excellent cheese. In several dairies culls, or inferior cheeses, were pointed out to me, and I was informed that last season was a difficult one for cheese-making.

Thorough knowledge of how to treat the milk on each particular farm seemed to be shown, and it was quite amusing to observe the emulation which existed. Nothing could exceed the satisfaction of the possessor of a thoroughly hard and inferior cheese made by an eminent maker in the neighbourhood and purchased at a shop. Its qualities were discussed with a care and minuteness which were quite touching, and finally the opinion was expressed that it was only fit for "boiling." It appears that in Leicestershire the rich and poor land is much intermixed, and the quality of the herbage varies considerably. In consequence of this the treatment of milk produced on each sort of land differs. It is said that the curd from milk obtained whilst cows are fed on rich land becomes acid sooner than curd from milk from poor land. The climate is also said to have a considerable influence in the manufacture of the cheese.

A well-known cheese factor informed me that he knew of a case where a farm which used to produce excellent cheese was ruined for cheese-making by being over-manured, that he had known a farm to suddenly fall off in its cheese-producing qualities without any apparent reason, and that land that is apt to be flooded will not produce good cheese. He told me he knew of a dairy where the cheese was damaged through being mixed with milk from another farm, which he described as salty milk, and that in his opinion different sorts of milk required different amounts of salt added when the breaking and salting of the curd takes place. He stated that fine cheese is made both from rich and from poor land. He agreed that milk from rich land required more careful management than milk obtained from poor land, and thought on the whole that more good cheese was made on the latter than on the former. In his opinion fine cheeses could be made out of Leicestershire if the soil and climate were suitable, and the maker had an accurate knowledge of Stilton cheese making. Whilst according to my information Leicestershire is said to turn out the finest cheese, other cheese of excellent quality is made in the adjoining shires, Derby,

Rutland, and Nottingham, and also a little in Wales and in Gloucestershire.

There is little or no difficulty in selling the best class of cheese, as the emptiness of the different store-rooms showed, but culls and inferior dairies of cheese are said to be hard to part with. The leading London dealers will only take the best class of cheese, and, together with the local factors, buy up most of the dairies of good cheeses as soon as they are ready, and before they go to market.

Three cheese fairs are held annually at Melton Mowbray and two at Leicester. A few factors sell on commission. Stilton cheese seems to be sold at a price per lb. per dozen cheeses, and is weighed fine, 1 lb. being deducted in every dozen for loss of weight. I was told that a dozen will sometimes lose even more than 1 lb. during a journey to London. Three leading London buyers stated that the sale of Stilton cheese in London is not on the increase, though the quality of the cheese brought in is as good as ever. My informants in Leicestershire seemed to think that the cheese manufactured now is not of such fine quality as formerly, but they can give no reasons for the fact. It is said that 1*s.* to 1*s.* 1*d.* per lb. is readily paid for the pick of the dairies. It is alleged that some fine cheese will occasionally not ripen up to expectation, and has to be sold by the dealers at a loss.

Medium cheese when rather new is largely sold for export, and is either sent out whole in skins or is broken up into small pieces and pounded into earthenware jars. It is in this form that much of the cheese is said to be sent out to India and Canada, and I was told that it developed blue mould on the voyage. Much of the inferior cheese is sold at the cheese fairs at prices ranging from 6*d.* to 9*d.* per lb., the latter being considered a price that will just pay. It is also said to find a market in the northern and eastern counties, and I fancy a good deal finds its way into the small London restaurants.

Everyone seems to say that more cheese is turned out now than formerly. As regards the output of an ordinary Stilton dairy there seems to be no average. The supply ranged from three cows to thirty in so-called average dairies, and from sixty cows upwards in large dairies. From small three-cow dairies the return was stated to be about 35 cheeses for the season—small 10 lb. ones. There is considerable difficulty in disposing of the cheese that is made before the cows go out to grass. Lately a trade has sprung up in Nottingham and in some of the adjoining towns for the sale of "green" or new cheese.

All my informants in Leicestershire seemed to agree that

the poorness of quality found in many of the cheeses which so many of the London dealers now complain of is not caused by the cream being extracted, as is often alleged, but by the

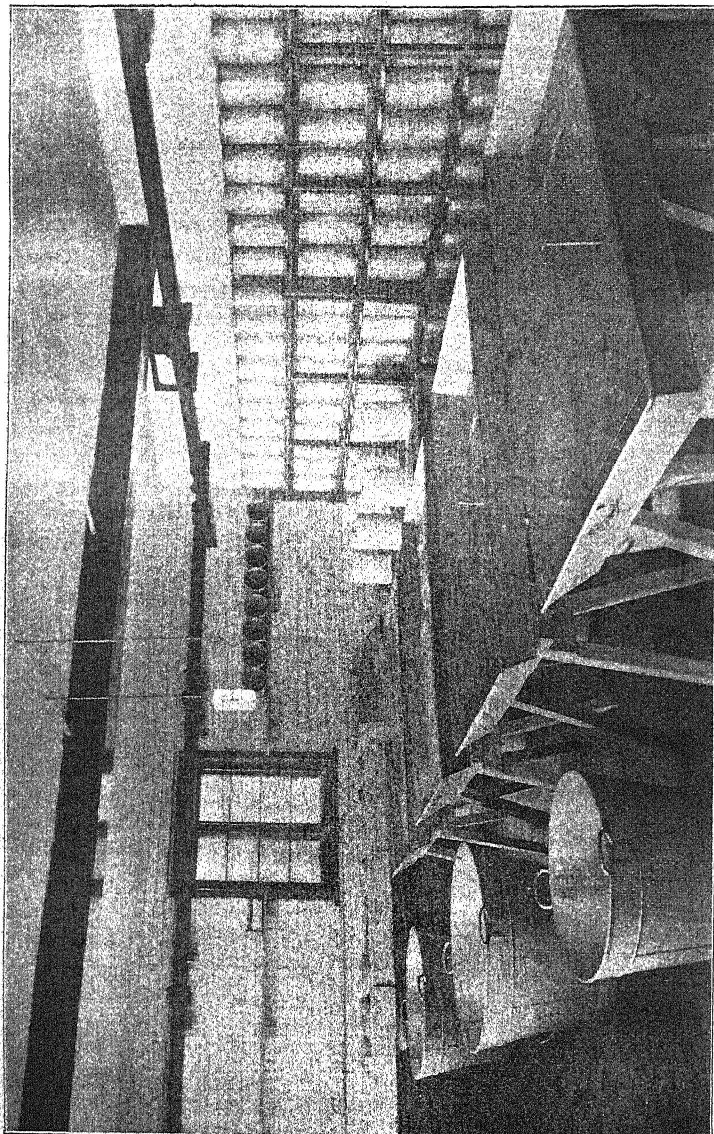


FIG. 1.—Mr. Henry Morris's cheese room.

injudicious handling of the milk and curd, and the want of proper knowledge and personal attention to details.

Some of the causes were stated to be as follows:—

1. Putting the milk together too hot.
2. The injudicious use of rennet.
3. Knocking the curd about too much.
4. Want of acidity at the time of breaking and salting.
5. Too much acidity in the curd when put into the hoops, which causes the curd to go hard.
6. The use of sour milk, which makes dry cheese.
7. Improper temperatures at different stages of the making and ripening.
8. The uneven mixing of two curds, the uneven mixing of salt, and the insufficient draining of the curd, each causing yellowish brown discoloration.
9. Crowding in the draining and coating rooms caused by too much cheese being made at once.

I found that some of the leading makers buy a considerable quantity of milk, which they mix together and turn into cheese. The results are said to be very good, but the quality and condition of the milk supplied has to be carefully watched, as sour milk is said to make cheese of inferior quality.

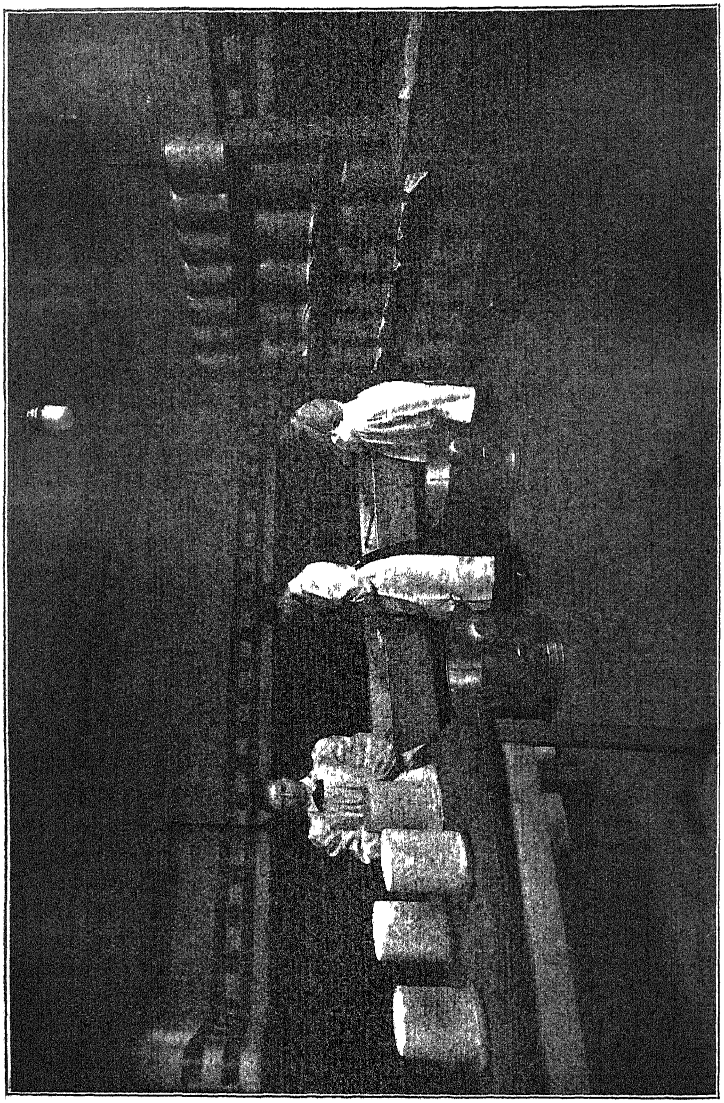
I give, in figs. 1 and 2, two illustrations of making rooms.

The larger one, belonging to Mr. Henry Morris (fig. 1), is situated at Stathern, and is a good type of a dairy in which a considerable amount of milk is dealt with. The size of Mr. Morris's dairy is 31 by 21 feet, outside measure.

The other, shown in fig. 2, is at the British Dairy Institute at Reading.

Four rooms are recommended for the manufacture of Stilton cheese, viz. making room, draining room, coating room, and store room, the size of the rooms depending on the quantity of milk to be dealt with. As a rule, I found that the draining of the cheeses is done in the making room. All the rooms were capable of being heated, the usual plan being to have hot-water pipes near the ceiling, so as to be away from the dirt. The coating and store rooms had plenty of ventilation, but care was taken that there should be no direct draught on the cheese. Most of the ventilators were covered with fine zinc, and had wooden slides. I noticed that many of the windows had frosted glass in them, and that the store rooms generally had shutters. Great care has to be taken to keep out the flies, which are said to be very troublesome and to damage the cheese. For the store room a northern aspect is preferred. In the more modern buildings the floor of the making room was of cement or red

tiles, and the walls were covered with white tiles. In most places, however, the walls were merely whitened. It is said that



From a photograph] FIG. 2.—Cheese room at the British Dairy Institute, Reading. [*by S. Victor White & Co, Reading.*

the use of lime-wash injures the cheese, and that the same remark applies to new buildings until they get seasoned.

It was a treat to hear how the work was schemed in the

rooms which were not very conveniently placed. In the older-fashioned farmhouses the store room is often in the house itself, and there is a considerable smell from the ripening cheese, which to a stranger is not very pleasant. The drains were outside the buildings, and were trapped and, as a rule, ventilated. In most of the places the whey ran by gravitation through earthenware pipes to the piggeries. I am told that lead pipes are good for carrying away the whey. Personal experience has proved that galvanised pipes soon fur up and corrode when used for conveying skim milk or whey. It is well to have a place at the top and bottom of the pipes for conveying the whey, in which draining rods can be inserted to clear the pipes in case they get furred up.

The following are the principal utensils used:—

1. Tin vat, plain or jacketed.
2. Tin scoop with thin edge, to hold about half a gallon of curd.
3. Curd sink, made of earthenware or tin.
4. Straining cloths, from 36 to 45 inches square.
5. Tin draining sink.
6. Tin with holes to go on the bottom of the drainer.
7. Pieces of wood to hold the strainer in the curd sink.
8. Perforated metal hoops.
9. Wooden boards to go under the hoops.
10. Draining shelves.
11. Shelves for coating room.
12. Table for turning the cheese, knife, calico, brush for mites, measuring glass for rennet, &c. &c.

Of course, the size of the different utensils and the draining shelves depends on the quantity of milk to be handled. The draining shelves have a rim round them, and are so constructed that the whey when it comes from the hoops runs along the groove and down a string into a vessel placed below the drainer. Most of these utensils can be seen in the preceding illustrations.

Cheese-making as a rule begins on March 25, when the milk contracts end, and goes on until the end of September, and even later in some cases.

The temperature at which the making room is kept seems to vary from 60° to 65°. Milk is brought straight into the dairy and carefully sieved into the vat. Where milk is bought, great care is taken to see that the quality is good and that it is not sour. In hot weather rennet is generally added when the milk is 80°, and in cold weather when it is 84° to 85°.

The rennet generally used is that made from dry or wet skins (or vells), which are said to vary greatly in quality, and

at times are difficult to obtain good. Much importance seems to be attached to getting the proper sort of skins.

There is no fixed rule as to the amount of home-made rennet to be used. The strength of each lot is tested, and the amount to be used is determined—by some makers by its power to coagulate the milk in a fixed time, which is said to be from 15 to 25 minutes, and by others by the appearance of the whey. I was told that on an average it was about 1 oz. of rennet to 5 gallons of milk, and that it varied from 4 oz. to 6 oz. according to the quality of the rennet and the quality of the milk. The object aimed at is to get the curd ready for ladling in from $1\frac{1}{4}$ to $1\frac{1}{2}$ hours.

Vells obtained from underfed calves are said to be of poor quality, whereas skins from well-fed calves which have sucked the cows till fat are highly prized. There seems no doubt that proper renneting plays a most important part in the manufacture of Stilton cheese. The following are a few particulars given to me by Mr. Miles Benson respecting the collection of vells and the subsequent curing of them. These vells, before they come into the hands of the cheese-maker, pass through the hands of two persons who appear to make a specialty, and most probably a living, out of their particular trade. They are first of all obtained by the collector, who has a connection with all the best butchers, and are packed in layers of salt in barrels in order to keep them in good condition during their journey. Then they are handed to the person or firm who dry and cut them into the form as sent out to the cheese-maker. This process occupies some weeks. In order to preserve vells to the best advantage they should be kept hanging from a dry ceiling or from some perfectly dry place where there is a circulation of pure air. Usually they are tied up in little bundles of a dozen in paper, and hung up from a kitchen ceiling. Under these conditions they will keep good from one to two years. In packing them to go abroad, it is recommended to pack them in dry hay in an ordinary box. Under these conditions they will keep right for any time up to two months.

No one seems to use Hansen's rennet, though Mr. John Benson, in his article on Stilton cheese, states that "in using prepared rennet the makers accustomed to the home-made article make no allowance for the strength of the former, and consequently add too much. This results in an inferior cheese, but the fault is due to the maker, and not to the rennet." When Hansen's rennet is used, it is said to be at about the rate of 1 drachm to every 3 or 4 gallons of milk. Care is taken that the mixing is done thoroughly by gently stirring the milk

for from eight to ten minutes, after which time coagulation should begin.

When the curd is ready for ladling, straining cloths varying from 36 to 45 inches square are placed in the curd sink, with pieces of wood to support the edges. The curd is then very gently ladled out of the vat into the cloths (fig. 3) with a tin scoop holding about half a gallon, from 3 to 4 gallons of curd being put into each cloth, the quantity depending a great deal upon the quality of the milk and the time of year.

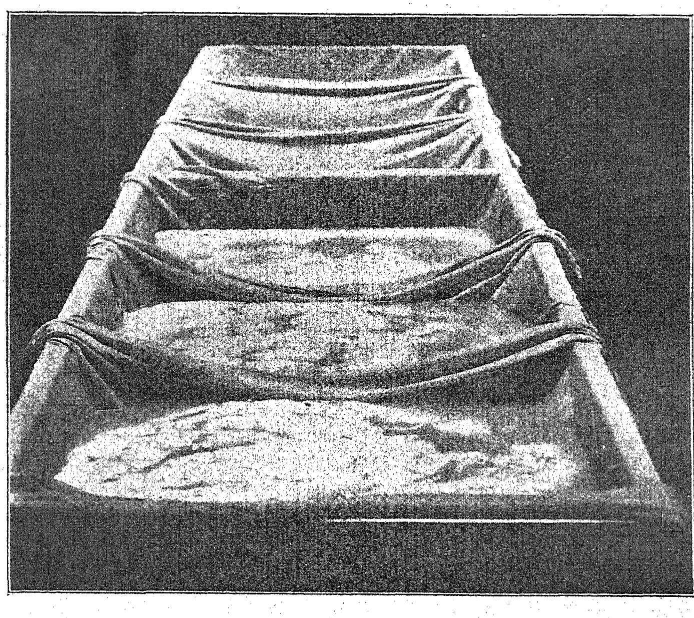


FIG. 3.—Straining cloths containing curd.

If too much curd is put into a straining cloth, it is said to be apt to set up too much acidity before the whey is drained off.

It is at this point where most of the difference in treating the curd occurs. I have, therefore, selected some of the methods I found in use for treating the curd before salting.

(1) Leave the corners of the straining cloth untied and with the plug out; allow the curd to drain. At the end of $1\frac{1}{2}$ hours tie the cloths, and tighten them at intervals of $1\frac{1}{2}$ hours till night, when as a rule the straining cloth had better be turned over and the curd left until morning; then cut the curd and turn it out into tins, and if the acidity will allow of it

let it stand over till the following morning. Next, if the acidity will permit, mix it with the evening's curd which has been treated in the same way, and has stood for 36 hours, or else let the curd from the night's milk stand for 36 hours and mix with the curd from the morning's milk at the end of 24 hours. [This explanation may seem vague, but it was taken down word for word, and I cannot find words to express the meaning better.]

(2) In one hour from ladling, tie the straining cloths loosely, and again in three hours; then draw off the whey, put the plug back for another three hours; then draw off the whey again, tighten the straining cloths, and allow the whey to continue to run for another $1\frac{1}{2}$ hours, when the curd should be turned out into the drainer (or lead), using the tin perforated drainer underneath. It is then left until it is fit to mix with the evening's curd, which has been treated just the same as the morning's milk.

(3) Let the curd stand in its own whey for $1\frac{1}{2}$ hours. Then draw off the whey, replace the plug and tie the straining cloths. Three hours afterwards let the whey run off and tighten the cloth. Let it remain for four hours more, and then put the curd out into the lead and leave until next morning. The less tightening of the cloths the better.

The following method is that adopted by Mr. Miles Benson at the British Dairy Institute:—

"Ladle about 3 gallons of curd with a sharp-edged scoop in quantities of about half a gallon at a time into straining cloths 36 inches square, placed in the draining trough. The quantity of curd and treatment during draining period must depend a good deal upon the milk and atmospheric conditions. Curd put in large quantities in summer is apt to set up acidity before the whey is sufficiently drained.

"Let the curd remain in the whey for an hour, then fold the corners of the straining cloths very loosely together, and allow the same curd to remain for another hour. Then let off the first whey, replace the stopper, and tighten the cloths twice or thrice according to the degree of acidity present. This should now be about ·12 of acidity. Keep the second whey on for two hours, unless there is an undue amount of acidity, when it should not be kept on at all. The acidity then should show about ·13 or ·14. Two hours afterwards, tighten the cloths and pile them two deep in order to assist drainage. The acidity should then be ·16 to ·18. Two hours afterwards empty the curd out on to the curd tray (acid ·18 to ·2), and leave it with its whey on till the following morning.

"The following morning the whey should be drawn off and

the curd cut up into cubes about 2 inches square, and allowed to drain for from two to three hours, when we should expect ·75 of acidity."

Mr. John Benson gives the following account of curd draining and development of acidity:—"When ready the curd is ladled out of the vat into straining cloths placed in the curd sink. These cloths are about a yard square, and hold from 3 to 4 gallons each. In the act of ladling, the curd is cut into thin slices, whereby the drainage of the whey is facilitated. The curd is allowed to stand for half-an-hour in its own whey, or longer if it is soft. The whey is then let off, and the curd tied up by bringing together the three corners of the straining cloth and using the fourth as a binder: and here in the curd sink it drains until evening. To aid the draining, tighten the cloths every hour during the first eight hours. This tightening requires to be done with care, so that the curd is not crushed in the operation. In the evening the curd is cut up into squares of about 4 inches, and laid in the draining sink with a light cotton cloth thrown over it.

"Here it remains overnight, and during this time it slowly oxidises. The evening's milk is treated in the same manner as the morning's milk, being allowed to drain during the night whilst in the curd sink. In the morning cut up the evening's curd, and then allow the two curds to develop the requisite amount of acidity. If acidity does not develop rapidly enough tear up the curds to aid it, or place them upon racks and keep them warm with hot water."

Most of the cheese is made from two curds. I was told that the method of making from one curd was much more risky.

There is a great divergence of opinion as to the tightening of the straining cloths. Some makers scarcely use any pressure at all, and tighten the straining cloths as little as possible, whilst others tighten the cloths at frequent intervals.

To tie up the curd the straining cloth is grasped with the left hand close to the curd, and with the right hand the loose corner is taken and the whole is turned together under the left hand (fig. 4). Great care must be taken not to unduly crush or press the curd, or the whey will run white. The great object should be to keep the whey green, but not too green. The curd is ready for ladling when it will break as if cut, if the finger is pushed along it.

When the curd is ready—that is, when it has developed the right amount of acidity—it is broken up by hand to the size of small walnuts, and salt added at the rate of about 1 oz. to 4 lb. of dry curd, or 1 oz. to 3½ lb. of wet curd, care being taken

not to get the curd pasty. I was told that the better the land the more the salt required. When the making is with two curds great care has to be taken that they are carefully mixed, and in both cases that the salt is distributed evenly.

During the cold weather in the spring the acidity is much more slow in developing, and consequently the time at which the curds should be mixed is often much greater than in summer. I found that in the spring some makers use a starter. A thermometer is used to test the temperature of the curds at the different stages.

As regards the way of ascertaining the correct amount of

FIG. 4.—Method of tightening straining cloth.

acidity when no acid test is used, Mr. John Benson in his paper states as follows: "It is always difficult to decide when the curds are ready, and experience is the only teacher. The following, however, are some of the signs that guide the makers as to the fitness of the curds. The first curd made should be clean, flaky, and decidedly acid, and free from sliminess or sponginess; the second should be in about the same condition, but not so acid. It takes usually 36 and 24 hours respectively before the curds show the above signs."

No test for acidity was used at any of the farms I visited. The acidity is judged by the taste, feel, and smell of the curd.

At the British Dairy Institute the dairy acidimeter is used.

The principle of this method is as follows: "The acidity in the milk, whey, or cream is neutralised by adding a solution of caustic soda of a certain strength, the exact point of neutralisation being indicated by a crimson colour produced in the liquid by the use of a chemical substance called phenolphthalein. The greater the degree of acidity present, the more soda solution will be required to produce the crimson tint (*i.e.*, to effect the neutralisation), and *vice versâ*."

When large quantities of curd are dealt with, a curd breaker is used. The ratio of curd to number of gallons of milk at the time of breaking and salting seems to vary greatly. Some makers break the curd when milk yields 18 lb. of curd to 12 gallons of milk, others when it yields 20 lb. of curd to 16 gallons; whilst others, again, say they break when the curd yields 25, 26, and even 27 lb. of curd to 15 gallons of milk. I am told also that the curd varies in quality and quantity in spring and autumn.

When the curd has been thoroughly mixed and salted, it is put into cheese hoops, which are placed on little round pieces of wood covered with "cheese greys" (calico). I found that, as a rule, fine curd was put at the top and bottom of the hoops. In only one case did I find that any pressure was used. The general practice seemed to be to put the curd into the hoops as light as possible. The hoops are filled to the top, and if necessary a small round tin or "Gath," as it is called, is used to take the extra quantity of curd. Then the hoops are put on the drainer, and after they have stood for about two hours they are turned by means of the piece of wood on to their other end on to another piece of board covered with cheese greys (calico), and replaced on the drainer. The cheese is always turned by the boards until the coat is thoroughly hard, and as long as it is in the draining room. After this the cheese is turned once every day for about seven days. It requires considerable practice to turn the cheese properly so that the edges do not get broken off. I have been informed that it is a very common practice to skewer the cheese in order to develop the blue mould and to hasten the ripening. At the dairies I visited I did not find that this practice was followed, but if a cheese did not drain properly it was turned over twice a day, and skewered through the ends.

The cheese in the draining room is generally kept at a temperature of 65°. Cheese should be ready for the binder in seven days, and in less time in very hot weather. I was informed

that if a cheese takes over nine days to drain it has probably been vatted too sweet, or kept at too low a temperature, and that a cheese which finishes draining under four days is usually too dry.

At the end of about seven days the cheese should have a rather elastic feel, and have slightly left the sides of the hoops. It is then turned out of the hoops on to a table, and the sides are scraped up and down with a table knife to fill in the little holes and cracks until the sides of the cheese are smooth and even. Then calico binders, which are a little longer than the cheese, are pinned lightly round the cheese.

After this the hoops are thoroughly washed and the cheese put back into them with a light cover over the top. Next day the cheese is taken out of the hoops and scraped as before. Fresh binders are put on, and the cheeses are placed on the draining shelves without the hoop. Fresh binders are put on every day.

In very damp, thundery weather a soft, greasy coat, which is called slipcoat, will sometimes form instead of the true coat, and this must be scraped off at once with a knife, and the cheese removed to a drier place.

In from seven to eight days according to one informant, and from ten to fourteen days according to others, the sides of the cheeses get wrinkled, and dry patches appear on the binders. After this takes place binding ceases, and the cheeses are taken to the coating room, which is kept at a temperature of about 55°. It appears that the air in the coating room should be moist, and that there should be a good current of air passing through, but not blowing direct on the cheese. If the room gets too dry, water may be sprinkled on the floor. I find that the time the cheese remains in the coating room varies at different farms, and depends on a variety of circumstances, the extent of accommodation being one.

The appearance of the coats seems to depend on the state of the weather at the time the cheese is taken out of the binders, dry weather making a nice smooth coat, and damp weather a heavy coat. I was told also that the fineness or coarseness of the coat depends a good deal on the amount of moisture left in the curd at the time of breaking and salting.

In about a month the coat will have fully formed, when the cheese can be put into the store room, which is kept at a temperature which seems to vary from 60° to 65°, and should be slightly damp until the blue mould sets in. Each day the cheese is turned and brushed, and the shelves kept clear of mites.

The less light there is in the store room the better. In about six months the cheese is ripe and ready for eating (fig. 5).

It is said that ironing or boring the cheese to test it helps to encourage blue mould, but care has to be taken that

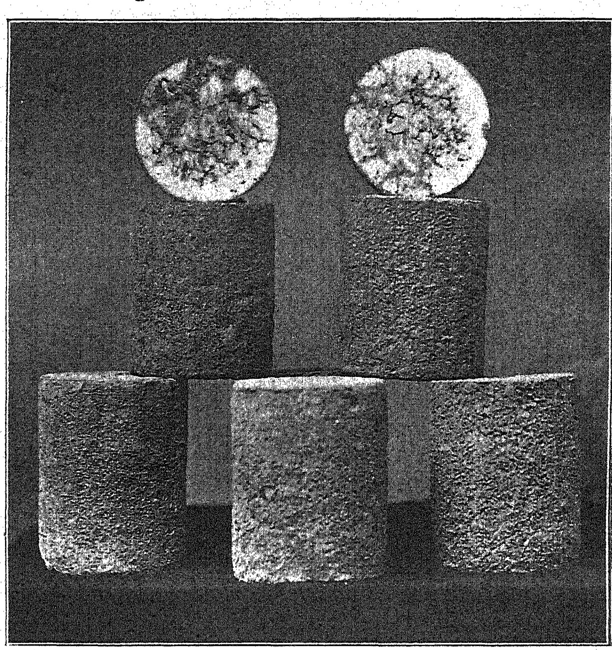


Fig. 5.—Stilton cheese.

the holes are carefully filled up. A Stilton cheese has a crinkled light drab coat, which seems to vary considerably in appearance, some looking almost smooth, whilst others have a rougher look. When ripe the cheese should be veined inside with blue mould.

The above is a description of the making of Stilton cheese according to information given to me in Leicestershire and elsewhere. The more I inquired into the subject, the more variations in methods of working came to my notice. I quite agree that at the present time it is impossible to lay down any definite and precise rules for the making of Stilton cheese so as to suit every case. I have endeavoured to point out certain methods of making, and certain causes of failure. I am convinced from what I saw and heard that nothing but practical

experience in cheese-making on each farm will show the best method of turning out a really first-rate cheese from milk obtained on the farm.

I found that excellent cheese is made from bought milk, but that the method of manufacture suited to a place where large quantities of mixed milks are dealt with would not do so well in a small dairy, and *vice versâ.*

Attention to details throughout the whole process of making Stilton cheese seems to be absolutely necessary in order to produce a first-class cheese. The secret of success in Stilton cheese making appears to be a thorough knowledge of the subject, and power to apply that knowledge with effect on whatever farm the maker resides. If a maker knows how to rennet the milk properly, and how to get the right amount of acidity at the time of hooping, I think two of the most important points will have been gained.

Some Stilton cheese makers seem to think that apprentices who have had training at a Dairy Institute are not so desirable as those who have had no previous training. With this, however, I cannot agree. In my opinion an apprentice who has been carefully trained in the science of cheese-making will, unless he is conceited, have a considerable advantage over one who has to learn by failure and bitter experience. He will know where to expect difficulties, and will have some knowledge of how to deal with them, as he will have been taught to appreciate the different causes that contribute to success or failure. The ordinary pupil at a farmhouse will merely learn the method adopted at that particular farm, which possibly may not be suitable for the next farm he goes to.

To all the farmers and their wives whose dairies I visited, to the London cheese buyers and Leicestershire cheese factors, and to Mr. Miles Benson and others who have given me information, I tender my cordial thanks for the very willing assistance they have afforded me.

J. Marshall Dugdale.

Llwyn, Llanfyllin, *viâ* Oswestry.

Official Reports.

REPORT OF THE COUNCIL

TO THE

SIXTIETH ANNIVERSARY GENERAL MEETING OF GOVERNORS AND MEMBERS OF THE SOCIETY,

HELD AT THE SOCIETY'S HOUSE,

13 *Hanover Square, W.*,

ON MONDAY, MAY 29, 1899

(*Adjourned from Whit Monday, May* 22, 1899),

The EARL OF COVENTRY (President) in the Chair.

THE Council have to report the following changes in the list of Governors and Members during the year which has elapsed since the last Anniversary Meeting in May 1898:—1 new Governor and 375 Members have joined the Society, 4 Members have been reinstated under Bye-law 12, and 2 Members have qualified as Governors; whilst the deaths of 4 Annual Governors, 2 Foundation Life Governors, 5 Life Governors, 2 Honorary Members, 72 Life Members, and 132 Annual Members have been reported. A total of 15 Members have been struck off the books under Bye-law 10, owing to absence of addresses; 114 under Bye-law 11, for arrears of subscriptions; and 244 have resigned.

2. Amongst other Governors and Members whose loss by death the Society has had to deplore since the General Meeting in December last are: The Duke of Northumberland, K.G., the Earl of Wharncliffe, Lord Newton, Lord Vernon, the Hon. Marcus Sandys, Baron Ferdinand de Rothschild, M.P., Sir Alfred S. Gooch, Bart., the Rt. Hon. Sir John Mowbray, Bart., Sir William Anderson, K.C.B., F.R.S., Sir Douglas Galton, K.C.B., F.R.S., Mr. R. Venables Kyrke (a Member since 1845), the Rev. A. H. F. Luttrell (a Member since 1842), Mr. Newzam Nicholson (a Member since 1845), Mr. G. A. Spottiswoode, Col. Le Gendre N. Starkie, and Mr. Christopher Sykes, M.P.

3. These and other changes bring the total number of Governors and Members now on the Register to 10,879, divided as follows :—

10	Foundation Life Governors (Members elected before the granting of the Charter on March 26, 1840) ;
75	Governors paying an annual subscription of 5*l.* ;
106	Life Governors ;
7,009	Members paying an annual subscription of 1*l.* ;
3,545	Life Members ;
111	Life Members by Examination ;
23	Honorary Members ;
10,879	Total number of Governors and Members,

as against a total of 11,094 Members at the same period last year.

4. To fill the vacancies caused by the deaths of the Earl of Lathom and Mr. W. T. Scarth, announced in the last Report of the Society, the Earl of Coventry has been appointed a Vice-President, and Viscount Baring and Mr. R. C. Assheton have been elected to seats on the Council. A vacancy in the list of Trustees has been caused by the resignation of Sir Archibald K. Macdonald on account of failing health. To fill this vacancy Sir John Thorold, Bart. (now a Vice-President), has been nominated as a Trustee, and Sir Jacob Wilson has been nominated as a Vice-President.

5. The accounts for the year 1898 have been examined and certified by the auditors and accountants of the Society, and are published in the current number of the Journal. The final results are that the total assets on December 31, 1898, amounted to 45,807*l.*, as against 48,572*l.* 5*s.* at the end of 1897. The invested funds of the Society are now represented by 11,000*l.* Consols, and 19,500*l.* Harewood House Debenture Stock.

6. The preparations for the holding of the Society's sixtieth Annual Country Meeting at Maidstone next month are well advanced. The Implement Yard and Dairy will be opened on Saturday, June 17, when the price of admission to the public will be 2*s.* 6*d.* On Monday, June 19, all departments of the Maidstone Meeting will be opened, when the price of admission to the Showyard will be 5*s.* Tuesday, June 20, will be the first day for visitors not specially interested in the judging; and on that date there will be the first parades of horses and cattle. The price of admission on Tuesday, June 20, and on Wednesday, June 21, will be 2*s.* 6*d.* On Thursday, June 22, and Friday, June 23, all departments of the Show will remain open, and the price of admission will be 1*s.*

7. The total amount of space allotted in the Implement Department of the Maidstone Meeting is 12,200 feet run, exclusive of open ground space, as compared with 15,491 feet at Birmingham last year, 15,532 feet at Manchester in 1897, 13,930 feet at Leicester in 1896, 12,597 feet at Darlington in 1895, 13,402 feet at Cambridge in 1894, and 13,018 feet at Chester in 1893. Fifteen entries have

been received for the prizes, amounting to 60*l.*, offered by the Society for cream separators, the trials of which will commence on Wednesday, June 14, in the Dairy in the Showyard. Seven entries have been received for the prize of 50*l.* offered by the Society for the best machine for washing hops with liquid insecticides, the trials of which will take place in a hop garden in the neighbourhood of Maidstone on Friday, June 16. No entry has been received for the prize offered by the Maidstone Local Committee for the best machine for the evaporation of fruit and vegetables. Six entries have been made for the two prizes of 5*l.* for the best package for the carriage of hard and soft fruit respectively, also offered by the Local Committee. A total of 49 "New Implements" have been entered for the Society's Silver Medals.

8. In the live-stock department there are 1,885 entries, as compared with 2,323 at Birmingham last year, 2,688 at Manchester in 1897, and 1,883 at Leicester in 1896. At the Maidstone Meeting there will be 424 entries of horses, as compared with 709 at Birmingham last year; 683 cattle, as compared with 792; 631 sheep, as compared with 624; and 147 pigs, as compared with 198 at Birmingham.

9. In the other departments of the Maidstone Meeting, there are 669 entries of poultry, 121 of butter, 74 of cheese, 104 of cider and perry, 62 of hops, 6 of preserved fruit and vegetables, and 258 of hives, honey, &c. The Judging of the Poultry and Produce will take place on Saturday, June 17; but the Poultry and Produce Sheds will not be opened to the public until Monday, June 19. There will be daily demonstrations in the Showyard by Mr. Edward Brown of the housing, feeding, plucking, and trussing of poultry for the table. Daily demonstrations of butter and cream and fancy cheese making will also be made by Miss F. Coward in the Dairy. For the prizes offered for shoeing light and heavy horses, open to shoeing-smiths in any part of the United Kingdom, 55 entries have been received.

10. As already mentioned, the Country Meeting of 1900 will be held on the Knavesmire, in the city of York; and the Council are happy to announce that His Royal Highness the Prince of Wales has graciously added to his many favours to the Society by consenting to be placed in nomination for the Presidency of that year, "in order to show the great interest which he takes in everything relating to agriculture."

11. For the Meeting of 1901 (which will be held in District F, consisting of the counties of Gloucester, Hereford, Monmouth, Salop, Stafford, Warwick, Worcester, and of South Wales) an invitation has already been received from the Mayor and Corporation of Cardiff, and such invitation will shortly receive the formal consideration of the Council.

12. In their December report, mention was made by the Council

of a further letter addressed by them to the Local Government Board, urging the importance of issuing without delay Model Regulations as to Dairies and Cowsheds which should carry into effect the recommendations of the Royal Commission on Tuberculosis, and thus place this very important question upon a more satisfactory basis. The Model Regulations on the subject, prepared by the Local Government Board, have now been issued to District Councils, and it is highly satisfactory to the Council that a differentiation has been made by the Board between the requirements as to cubic air-space in cowsheds in towns and cowsheds in the country. But, as they have pointed out to the Board, there are considerable areas included in Urban districts which are to all intents and purposes in the country, and the cowsheds in which are occupied by cows that "are habitually grazed on grass land during the greater part of the year, and when not so grazed are habitually turned out during a portion of each day"—this being in effect the distinction between town and country drawn by the Board in the Model Regulations.

13. In many districts, regulations are already in force which are unnecessary and unduly restrictive in the case of rural cowsheds occupied by cows turned out as above; notwithstanding which, such cowsheds are subject to the same restrictions as town cowsheds by reason of being included in the area of an urban district. In the Board's Circular of March 11 last, Local Authorities were invited to consider the new Model Clauses "in connection with any fresh Regulations or amendment of the existing code which the District Council may propose to make." But unless some further action were taken by the Board, it appeared to the Council that considerable hardship might be caused to farmers living in districts technically urban where Regulations now exist imposing upon every cowshed, wherever situated, the necessity of an uniform minimum cubic air-space per cow. The Council therefore suggested to the Board that it should be made clear to Local Authorities, by means of a further circular or otherwise, that in the opinion of the Board the power which Local Authorities possess of making regulations as to dairies, cowsheds, and milkshops, under Article 13 of the Order of 1885, should be regarded as subject to the limitations contained in the Board's Circular of March 11, 1899; and that if regulations are now in force in any district which are in excess of the requirements laid down in the recent Circular, the District Council should be invited to bring its local regulations into harmony with the new Model Regulations of the Local Government Board.

14. The Local Government Board have expressed their inability to undertake to issue such a circular; but have pointed out that "if the existing Regulations in any particular district were felt to be onerous, it would be open to the dairy farmers to approach the Local Authority on the subject, with a view to their considering the

question of modifying the Regulations on the lines of the Board's Model Code." Under these circumstances, it does not appear that any useful purpose would be served by the Society again addressing the Local Government Board on the subject ; but with reference to the paragraph quoted above from the final letter of the Board, the Council think the attention of landlords, dairy farmers, and others may well be directed to Section 14 (3) of the Order in Council of June 15, 1885, under which :—

> If at any time the Local Government Board are satisfied on inquiry, with respect to any regulation, that the same is of too restrictive a character, or otherwise objectionable, and direct the revocation thereof, the same shall not come into operation, or shall thereupon cease to operate, as the case may be.

If, therefore, in any particular case the owner or occupier of a rural cowshed considers that the existing Regulations of the Local Authority are too restrictive in character in their application to his own cowshed, it appears to be open to him to appeal to the Local Government Board for an inquiry, with a view to the revocation of such by-law or the exemption of his cowshed from its operation.

15. In view of the great public interest which is at present displayed in the subject of the prevention of Tuberculosis, the Council have thought it desirable to issue a leaflet on Tuberculosis in Dairy Stock, some 12,000 copies of which have already been circulated amongst farmers, land agents, veterinary surgeons, County Council authorities, and others. A Welsh edition of this leaflet has also been put into circulation. A further leaflet has been issued on the subject of Quarter Evil, or Symptomatic Anthrax, and the existing leaflet dealing with Epizootic Abortion in Cows has been revised. Copies of any of these leaflets will be forwarded post free on application to the Secretary.

16. During the last six months the outbreaks of Anthrax have been almost the same in number as during the corresponding period of 1897-98. There has been a sensible decline in the prevalence of Glanders, both in respect of the number of outbreaks and of animals attacked ; but Swine Fever has increased rather than diminished. The most gratifying feature of the period has been the decline of Rabies, which the existing Regulations have apparently brought to the verge of extermination, only two cases having been notified since September 1898. Since the autumn of last year a remarkable epizootic disease has prevailed among the dogs in the South of England. Reports show that it has also made its appearance in several towns on the Continent of Europe. The disease is new to veterinary literature, but there are grounds for believing that it has been in existence for an indefinite time among dogs in India, and that it has been imported thence into Europe.

17. The number of morbid specimens forwarded during the past half-year to the Department of Comparative Pathology and Bacterio-

logy established at the Royal Veterinary College by the aid of a grant from the Society was 216, and during the same period 1,751 doses of mallein were supplied gratis to veterinary surgeons for use in the diagnosis of glanders. Some experiments regarding the curative effects of mallein and the possibility of rendering horses immune against glanders, and others regarding the cause of pneumonia in the horse, have been instituted and are still in progress.

18. The number of samples submitted by members for analysis by the Consulting Chemist has been somewhat less than last year. From December 1, 1898 to April 30, 1899, 425 samples have been sent, as against 510 in 1898 and 431 in 1897 for the same period. The reports issued from time to time by the Chemical Committee continue to bring out matters of considerable importance to members of the Society.

19. At the Woburn Farm, experiments have been conducted during the winter on the early feeding to bullocks of mangels in lieu of swedes, with the view of ascertaining what can best prevent the "scouring" effects attributable to mangolds if fed to stock before Christmas. An experiment on the use of gorse for fattening sheep has also been carried out. The corn crops of 1898 have been threshed and separately valued by experts, as was done last year.

20. The second year of the experiments at the Woburn "Pot Culture" Station has now been entered upon, and the investigations contemplated under the Hills' Bequest are being continued. Meteorological observations have been continuously made since October last, and the records duly returned to the Meteorological Office.

21. The Grass experiments instituted by the Society in different parts of the country are being carried on, certain changes in the manurial treatment at some of the stations having been made by the instructions of the Chemical Committee.

22. The quality of the seeds examined by the Consulting Botanist during the past half-year has been satisfactory. The fungal injuries to plants include the reappearance of *Sclerotinia trifoliorum*, which practically destroyed a field of red clover in the Midlands, but the attack of this fungus has not been so wide this season as was reported last. A fungus which has only recently been observed in Britain, *Phoma betæ*, has done serious injury to mangel roots in some places in the South of England. Injuries to animals investigated have included the death of fowls from eating "seeds" containing a considerable proportion of corncockle, injury to horses from eating oats containing the seeds of a *Lathyrus*, and to calves from eating the leaves of rhododendron.

23. In October last the Zoologist was instructed to inspect and report upon a very severe attack of Aphis in swedes. Since that time—as is usual during the winter months—no widespread insect

attack has been brought to his notice, but various applications of local interest have been received and dealt with. Insects in stored grain, larch aphis, and the occurrence of the wood leopard-moth in an orchard, have been the subjects of inquiry. Advice has been asked, through members of the Society, with regard to certain foreign pests, notably an orchard beetle (*Mylabris lunata*) from South Africa, and a curious leaf-eating caterpillar from South America.

24. Forty-four entries were received for the Society's Examination in Agriculture, which took place from the 9th to the 13th instant. The replies of the candidates are now under the consideration of the Examiners, and the results will be announced as soon as possible. It is contemplated after the present year to hold an Examination for a National Diploma in Agriculture, to be conducted conjointly by this Society and the Highland and Agricultural Society of Scotland. The Regulations and Syllabus for such Examination are now under the consideration of the respective Councils.

By Order of the Council,

ERNEST CLARKE,

Secretary.

13 Hanover Square, London, W.

REPORT OF THE EDUCATION COMMITTEE ON THE RESULTS OF THE EXAMINATION IN AGRICULTURE, 1899.

THE Committee have to report that for the Society's Examination in the Science and Practice of Agriculture, held from the 9th to the 13th of May, 1899, forty-four candidates entered, of whom forty-two (the same number as last year) competed, and that twenty-seven of the competitors have satisfied the Examiners.

2. The following twenty candidates, placed in order of merit, have gained the Society's Diploma in the Science and Practice of Agriculture. The first candidate (having obtained over three-fourths of the maximum number of marks—1500) will also receive Life Membership of the Society and the Gold Medal. The next four candidates (having obtained over two-thirds of the maximum number of marks) will each receive the Life Membership of the Society and the Silver Medal.

1. JOSEPH HENRY HINCHCLIFF, Yorkshire College, Leeds.—(1200 marks.) *Gold Medal and Life Membership of the Society.*

2. LAWRENCE ABRAM, Durham College of Science, Newcastle-on-Tyne.—(1155 marks.) *Silver Medal and Life Membership of the Society.*
3. ADOLF H. DELLSCHAFT, South-Eastern Agricultural College, Wye, Kent.—(1128 marks.) *Silver Medal and Life Membership of the Society.*
4. SAMUEL SIMPSON, Wiswell, Whalley, Blackburn.—(1118 marks.) *Silver Medal and Life Membership of the Society.*
5. THOMAS NEWTON, Agricultural and Horticultural School, Holmes Chapel.—(1074 marks.) *Silver Medal and Life Membership of the Society.*
6. HERBERT WILLIAM ALLISON, Yorkshire College, Leeds.
7. FRED SMITH, Agricultural and Horticultural School, Holmes Chapel.
8. WILLIAM JACKSON, Agricultural College, Aspatria.
9. { ERIC ARTHUR NOBBS, The University, Edinburgh.
   JAMES ERNEST THOROLD, South Eastern Agricultural College, Wye, Kent. }
11. JOHN HENRY BURTON, Durham College of Science, Newcastle-on-Tyne.
12. ROBERT GWILLIM, The Agricultural College, Aspatria.
13. JOHN EDWIN RIGG, Crake Side, Greenodd, Ulverston.
14. GEORGE RYCE, Agricultural College, Uckfield, Sussex.
15. { WARBURTON C. JARDINE, Glasgow and West of Scotland Technical College, Glasgow.
   HUGH C. SAMPSON, Barnard Castle, co. Durham. }
17. JOHN CHRISTOPHER FRYER, The College, Reading.
18. HERBERT FREDERICK BENGER, South Eastern Agricultural College, Wye, Kent.
19. GEORGE BERNARD NICKSON, The Park Farm, Prestwich, Manchester.
20. ROWLAND GURNELL, University College, Nottingham.

3. The following seven candidates, having passed in Agriculture and in three of the four other compulsory subjects, are entitled to Second Class Certificates :—

21. ALFRED SMITH, Jun., The Agricultural College, Uckfield.
22. JOHN WILLIAMSON, Agricultural and Horticultural School, Holmes Chapel.
23. WILLIAM SEPTIMUS HARRISON, Agricultural College, Aspatria.
24. JOHN ROBERTS, University College of Wales, Aberystwyth.
25. WILLIAM RICHARD LLOYD-WILLIAMS, Agricultural College, Aspatria.
26. JOHN HANNATH, University College, Nottingham.
27. PATRICK JOSEPH HANNAN, Clifton House, Loughrea, co. Galway.

4. Of the compulsory subjects, ten candidates failed in Agriculture, eleven in Book-keeping, ten in Chemistry, thirteen in Mensuration and Land Surveying, and thirteen in Agricultural Engineering. Of the optional subjects, there were four failures in Geology, six in Botany, four in Veterinary Science, and eleven in Agricultural Entomology.

5. The Examiners in Theoretical and Practical Agriculture (Professor McCracken and Mr. T. A. Dickson respectively) report that there is "a marked improvement on the part of candidates in the recognition and pricing of farm products and imported feeding stuffs, and also in their familiarity with the seeds of crops and pasture plants. Dairying has again proved to be the branch of farming to which most attention has been given: indeed, dairying seems to have monopolised the attention of many candidates, to the detriment of their knowledge of other systems of farming, more especially those involving a knowledge of sheep and their management. Questions relating to the arrangement and dimensions of farm buildings were only in exceptional cases well answered, and the sketch plans drawn were by no means creditable. Except in dairy farming, in which a fair knowledge of accounts was shown, much greater attention should be given to such estimates of receipts and expenditure as every prudent farmer might be expected to make before entering upon the tenancy of a farm. Great weakness was shown by the majority of the candidates in the business aspect of the subject, more especially with regard to rates and taxes."

6. The Examiner in Book-keeping (Mr. C. P. Hall) reports that "the majority of the papers show a certain amount of knowledge of systematic book-keeping. No one candidate, however, produced a perfectly correct account, and although some few papers were highly creditable, a large proportion showed a want of accuracy in figures, and neatness in working, rather than lack of knowledge of method. The paper was by no means an intricate one, and better work would have resulted had more attention been given to the points alluded to."

7. The Examiner in General Chemistry (Professor Liveing, F.R.S.) reports that "on the whole the majority of the candidates have shown a fair acquaintance with general chemistry so far as it can be learned from text-books; but many of them do not seem to have grasped the fact that what may be theoretically possible is often, for various reasons, impracticable. The very easy question about the determination of common salt in a sample of crude nitre was not answered decently by more than a third of the candidates, and I doubt if more than half a dozen of them could have actually performed the simple operations involved with success. I was equally struck by the unpractical character of the answers to some other questions, though as to facts, and in many cases as to theory, they were by no means bad; and I am persuaded that the

candidates would acquire a more useful knowledge of chemistry if they gave more attention to a laboratory course." The Examiner in Agricultural Chemistry (Dr. J. Augustus Voelcker) reports that "the written work was, as a rule, better done than the *vivâ voce* examination, and, indeed, in the former there was a general similarity of attainment and style of reply without any very marked excellence being displayed."

8. The Examiner in Mensuration and Land Surveying (Mr. H. Trustram Eve, F.S.I.) reports that "the candidates who were successful did very good work, and apparently had been well taught. In Surveying, the straightforward question of plotting from field notes was exceedingly well done by nearly all. Knowledge was not, however, sufficiently shown in plotting the corners of the field in question. The other questions in Surveying which were given as a test of the candidate's power of *applying* his knowledge (such as setting out a field in allotments and laying down the necessary lines for the survey of a dense wood without the aid of a theodolite) were badly done if attempted. The practical work of the candidate had evidently stopped at a simple survey of a field, and very little knowledge was shown in *vivâ voce* of the methods to be adopted in setting out the necessary survey lines of larger areas, such as small farms, &c., or three or four fields in a ring fence. Candidates seemed to be well acquainted with the Ordnance map of twenty-five inches to a mile, but displayed much ignorance of the one-inch, six-inch, and town scales. Candidates, with some exceptions, seemed to know the theory and practice of levelling; but evidently outside work had not sufficiently been attempted.

"In the Mensuration questions the methods used were cumbersome and old-fashioned; candidates seemed to revel in the reduction of whole numbers and fractions to either decimals or inches or links, creating an immense long division or multiplication sum such as they were taught in their younger days. The working of one question which could be correctly expressed in forty figures had in almost every case extended to 250. It is most important for those who are entering a business life that they should learn the shorter methods of arithmetic, and not be content to rely upon the laborious ones which they were taught as a ground-work at school. The candidates apparently were fairly acquainted with the necessary elementary knowledge of instruments, and questions on the theodolite were well answered."

9. The Examiner in Agricultural Engineering (Mr. F. S. Courtney, M.Inst.C.E.) reports that "upon the whole the result of the examination was better than last year. On the present occasion there was not so large a choice of questions as in former years, and the natural result was that the weaker candidates did not do quite so well; but of the forty-two candidates who presented themselves for examination, two-thirds did very fairly well, and

six candidates obtained seventy-five per cent. of full marks. With regard to the sketching, there seems to be no improvement, though attention has been called to this on several occasions by my predecessor, the late Sir Wm. Anderson. Elaborate or finished sketches are not expected, but they should be intelligible; and from another point of view they are of importance, as there is no better way of acquiring a thorough knowledge of the mechanical details of any machine than to work them out on paper in an intelligible sketch."

10. In the optional subjects, the Examiner in Geology (Professor T. Rupert Jones, F.R.S.) reports that the results of the examination in this subject were "quite satisfactory," two of the candidates having obtained full marks, and two others very nearly that amount. The Examiner in Botany (Mr. W. Carruthers, F.R.S.) reports that "the examination papers represent a higher level of excellence than I remember in any previous examination."

11. The Examiner in Veterinary Science (Professor Sir George Brown, C.B.) reports that "only four candidates failed to reach the pass number of marks; the remainder attained a high average, the majority of them getting above two-thirds of the maximum marks. Several candidates who failed in the *vivâ voce* recovered their position in the written papers, the majority of which indicated that the candidates had been well taught. The chemical knowledge displayed was, however, far in advance of the anatomical and physiological knowledge, as was shown particularly in the answers to questions relating to structure, which word was frequently interpreted to mean chemical composition. In the answers to the questions relating to the nutritive value of the components of various foods, the majority of the candidates proved that they had gained a very creditable knowledge of the subject." The Examiner in Agricultural Entomology (Mr. Cecil Warburton, M.A.) reports that "there were few papers of exceptional merit, but most of the answers were fairly accurate and practical. Failure was in most cases due not to blunders, but to insufficiency of information."

12. Speaking generally, the results of this year are satisfactory. The Examination is purposely made a searching and comprehensive one, and it may be regarded as evidence of the thorough character of the teaching now available at different agricultural colleges and schools that twelve of the twenty candidates who gained First-Class Certificates earned more than two-thirds of the maximum number of marks—eight of the twelve being young men under twenty-one years of age. It is satisfactory, moreover, to find that these teaching facilities appear to be more utilised than formerly by young men whose parents are of the agricultural class, since of the twenty winners of First Class Certificates, twelve (including four of the five Medallists) describe themselves as the sons of

farmers. The Examination had been previously attempted last year by five of these twenty candidates, and all had succeeded in improving their position as regards the number of marks awarded to them.

MORETON,
Chairman.

13 Hanover Square, London, W.
May 30, 1899.

EXAMINATION IN AGRICULTURE.

MAXIMUM NUMBER OF MARKS FOR THIS SUBJECT, INCLUDING THE *VIVÂ VOCE*, 300. PASS NUMBER, 150.

PART A.—AGRICULTURE AS TAUGHT IN THE CLASS-ROOM.

(*Time allowed, three hours.*)

Not more than EIGHT of the following questions are to be answered. Nos. 4 and 5 must be attempted.

1. Where in the United Kingdom do chalk and new red sandstone formations occur? Compare the soils and systems of farming which prevail upon these formations.

2. With respect to wheat, barley, oats, beans, swedes and potatoes, state what you know of the various methods of cultivation practised in different parts of the kingdom, and indicate what you believe to be the reasons for the diversities of practice you have mentioned.

3. Enumerate the crops usually grown as "Catch Crops;" and explain the circumstances under which the growth of catch crops may be advantageous. Describe briefly their cultivation, and state the uses to which they are put.

4. Make out an inventory and valuation, dated 1st May, 1899, of the live and dead stock, tillages, and other unexhausted improvements upon a dairy farm of 300 acres (225 acres permanent pasture, and 75 acres tillage), the rent of which, including tithe, is £475.

5. Draw a rough plan of a steading suitable for the farm described in the previous question, showing the relative positions of the accommodation for the different kinds of stock, and note the principal dimensions.

6. How would you feed and treat a shorthorn cow in full milk in June, and one in full milk in February? Estimate the cost of producing a gallon of milk in each case.

7. Having a hundred gallons of milk to deal with, compare as to pecuniary results the sale of (*a*) cream; (*b*) butter; (*c*) hard cheese; and (*d*) soft cheese, which might be made from it. Describe the process of making one variety of soft cheese.

8. State your views as to how the interests of dairy farmers are affected by tuberculosis. What steps would you take to get rid of the disease from your herd, and to prevent its being communicated to sound animals and young stock?

9. Give an account of the rearing of a shire gelding from birth until "quiet in all gears," and estimate the cost.

10. Describe the management of a flock of one thousand pure bred mountain ewes for one year, noting the more important dates. State the breed

and the locality you have chosen, and add an estimate of the principal outgoings and receipts.

11. Why are sheep dipped? In the case of a breeding flock, at what seasons would you dip? Draw a plan, giving dimensions, of the apparatus you recommend to be used; and describe the process of dipping. How would you compound your dip (*a*) for summer use, (*b*) for winter use, and what should it cost per hundred sheep?

12. What seeds would you sow on a heavy loam soil for one, two, and four years leys? When and how would you sow the seeds, and what would the cost per acre amount to?

Part B.—Agriculture as Acquired by Practical Experience in the Field.

(*Time allowed, three hours.*)

Not more than SIX of the following questions are to be answered. Nos. 1, 2, and 3 must be attempted.

1. (See above.) A farm of 575 acres in the Midlands was given up at Lady Day, and in the absence of suitable applicants the landlord has decided to farm it himself. It is situated five miles from a market town and railway station, and about two miles from the nearest village. The soil is heavy clay capable of producing good corn crops; 300 acres are arable, the remainder is grass, only suitable for sheep or store cattle. There are two good sets of premises in which there is accommodation for wintering 50 beasts in open and covered yards. The fields each average 20 acres in extent, and about 160 acres are suitable for roots. There are four cottages on the farm, but the rest of the labour has to come from the village two miles away. The rent is 300*l.* per annum, the land tax 15*l.*, the tithe 50*l.*, and the rates three shillings in the pound.

State what capital will be required for such a farm, and show in as much detail as time will allow how it is to be apportioned.

What style of farming would you recommend on such a farm; what class of beasts and sheep would you keep--giving reasons for your choice—and what course of cropping should be adopted? How would you manage the labour? Show by Profit and Loss account and Balance Sheet how you would propose to pay the necessary expenses, including rent, rates and taxes, and interest on capital employed. (The exact amount of each of these last-mentioned items should be stated.)

2. (See above.) Give in detail the management of the ewe flock from September 1 to the time the lambs are weaned.

3. (See above.) Supposing you decided to keep pigs on the farm, what breed would you prefer? Briefly sketch the management of the same.

4. What are the special characteristics of the Hereford breed of cattle? State briefly the way in which a herd of such cattle is most satisfactorily managed with a view to profit.

5. Draw a plan and elevation of yard and field premises for 12 beasts, specifying materials used and showing section of roof proposed to be adopted. What would be the approximate cost of such premises?

6. Give in detail the preparation for mangel after a corn crop, stating the quantity of farmyard and artificial manure per acre, and when and how applied; with cost of (1) Tillage, (2) Manure, (3) Hoeing, (4) Pulling, carting, and storing per acre.

7. Write what you know about Sheep scab, the regulations at present in force, and the ways in which in your opinion these regulations could be improved with a view to its complete eradication.

8. State briefly the principal uses of lime in agriculture and the modes of its application.

9. Give your views as to any defects in the Agricultural Holdings Act 1883, and state how in your opinion it can be improved.

10. State your opinion as to a farmer keeping poultry on an extensive scale. What breed or breeds would you recommend, and what plan of operations would you adopt?

EXAMINATION IN BOOK-KEEPING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

(*Time allowed, three hours.*)

1. Journalise the following transactions, post them into a ledger, make out a Balance Sheet and a Profit and Loss Account.

To lessen the number of entries in the ledger, the single heading "Live Stock" may comprise all the animals except horses; single entries may also be used for "Rent, Rates, Taxes, and Insurance," for "Seeds, Manures, and Foods Purchased," for "Tradesmen's Bills and Petty Cash," and for "Corn, Hay, and Straw."

Robert Simmons is in a farm: at the beginning of the year his assets were:—

	£	s.	d.
Corn and Hay in stack	580	0	0
6 Horses	240	0	0
1 Nag	30	0	0
100 Sheep	200	0	0
20 Cows	300	0	0
Implements	200	0	0
10 Bullocks	180	0	0
Poultry	10	0	0
His Liabilities were:—			
Landlord	112	10	0
Sundry Bills	25	0	0
Overdrawn at Bank	150	0	0
During the year he pays:—			
Rent	225	0	0
Rates, Taxes, and Insurance	35	0	0
Seed Bills	10	0	0
Incidentals and Sundries	30	0	0
Implements and Repairs	10	0	0
Manures	25	0	0
Labour	250	0	0

His transactions in Stock were as follows:—

2 Horses bought at 20*l.* each, and two sold at 35*l.* each.
12 Bullocks bought at 11*l.* each, and 8 at 8*l.* 10*s.* each.
5 Bullocks sold at 19*l.* 10*s.* each, and 5 at 20*l.* 10*s.* each.
30 Ewes bought at 2*l.* each.
100 Lambs bred on the farm sold at 1*l.* 15*s.* each.
15 Pigs bought at 19*s.* each, and 15 at 1*l.* 1*s.* each.
1 Ram bought at 10*l.*
12 Pigs sold at 2*l.* 18*s.* each, and 18 at 3*l.* 2*s.* each.
16 Calves bred on the farm at 2*l.* 10*s.* each.

He receives for the following produce:—

	£	s.	d.
Wool	20	0	0
Dairy Produce	80	0	0
Poultry and Eggs	30	0	0

He buys 10 tons of Cake for 65*l.*

He sells Corn to the value of 465*l.*, for which he receives 440*l.* in cash, the balance remaining due.

He loses 5 Sheep by death.

He makes all payments by cheque, and pays all moneys received into the Bank.

At the end of the year his Valuations are :—

	£	*s.*	*d.*
Corn, Hay, and Straw in stack	500	0	0
Horses and Nags	260	0	0
Cattle remaining at 16*l.* per head			
Sheep remaining at 2*l.* per head			
Poultry	12	0	0
One-half his Cake bill			
His Implements less 10 per cent. for depreciation			
His debts are :—			
Landlord	112	10	0
Tradesmen	50	0	0

2. What would you understand if told to post the ledger? Explain briefly the use of the ledger.

EXAMINATION IN CHEMISTRY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

PART A.—GENERAL CHEMISTRY.

(*Time allowed, three hours.*)

Not more than EIGHT of the following questions are to be answered. Nos. 6 and 11 must be attempted.

1. Give an account of the occurrence in nature of the elements nitrogen and potassium, stating both where each occurs and in what sort of combination.

2. What chemical change in the air is produced by the breathing of animals? Is the air expired (1) of the same volume, (2) of the same weight as that inspired? Explain the reason for your answer.

3. Describe how to prepare from the neutral carbonate (1) caustic potash, (2) the bi-carbonate; and explain the chemistry of the processes.

4. Give an explanation of the effects produced in—
   (*a*) Blowing a fire;
   (*b*) Mixing soap with hard water;
   (*c*) Putting a lighted candle into a mixture of coal-gas and air;
   (*d*) Heating polished steel till it turns blue;
   (*e*) Distilling vinegar until half has passed over.

5. Calculate the least weight of sulphuric acid that will convert one ton of bone earth into soluble superphosphate; and also the weight of hydrochloric acid equivalent to that quantity of sulphuric acid. $Ca : P : S : Cl = 40 : 31 : 32 : 35{\cdot}5$.

6. If a sample of crude saltpetre contain sodium chloride, explain how to determine the proportion in which the latter is present in the sample.

7. What is "dialysis"? What sorts of substances can be separated thereby? Explain how to carry out the process so as to separate completely gelatine from a solution in which salt is also present.

8. Explain the relations, as to chemical composition, and as to properties, between starch, cane sugar, and grape sugar. In the ordinary fermentation

of a solution of grape sugar, what is the chief chemical change? Name substances which, if added to the solution, stop fermentation, and give some explanation of this effect.

9. State the chemical composition of ammonia by weight and by volume; and give an account of its chief properties. How has it been shown that there is usually a very little ammonia in the atmosphere, and why is the amount only a very little?

10. What are the elements of albumen? Explain how to demonstrate the presence in albumen of each of the elements you name.

11. How do wrought iron and steel differ from each other in composition and in properties? The atomic weight of iron is 56, its equivalent weight in ferrous salts 28, and in ferric salts 18·7: explain what is meant by these statements, and give examples to illustrate them.

12. State the chemical composition of litharge, red lead, and white lead. Explain what chemical changes occur when litharge, mixed with a vegetable oil (such as linseed oil), is boiled with water.

Part B.—Agricultural Chemistry.

(Time allowed, three hours.)

Not more than EIGHT of the following questions are to be answered.

1. Whence are the nitrogenous constituents of plants derived? Describe the elaboration of the materials into the various (nitrogenous) constituents found in the plant at respective periods of growth.

2. What part does iron play as a constituent of vegetable life? In what forms are compounds of iron found or made use of in agriculture?

3. Discuss the advantages of sufficient, and disadvantages of deficient or excessive moisture in soils, as also the modifications that different classes of soil will induce.

4. What are the chemical advantages, as regards soil and crop, produced by drainage of land? When may drainage be unnecessary? Is it possible to overdrain land?

5. Discuss the influence of rainfall as affecting the action and removal from the soil of nitrate of soda and sulphate of ammonia respectively.

6. State generally the effect of manuring upon the quality of malting barley.

7. What starches, produced from farm crops, are made use of commercially, and what are the principal uses of each?

8. Describe the chemical changes involved in the production of cider from apples.

9. In what principal respects does the manuring suitable for fruit trees differ from that for corn crops? Give examples of manurial materials specially adapted for fruit growing.

10. What main constituents are removed from the soil by the grazing of milking cows? Contrast this with the grazing of the same land by bullocks.

11. Define "skim milk" and "separated milk." Show what variations in the quality of each may occur in practice, and indicate the circumstances which may cause such variations.

12. In what main respects does butter-fat differ from animal fats, and by what means can one or the other fat be distinguished?

EXAMINATION IN AGRICULTURAL ENGINEERING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

(*Time allowed, three hours.*)

Not more than EIGHT of the following questions are to be answered.

---

1. In what proportion does the depth of a beam of any given width and span affect its strength?

2. It is required to make a warehouse floor 15 ft. span by 20 ft. long to carry a load of 100 lb. per square foot. Sketch the arrangement of such floor, giving the scantlings of main joists, cross joists and flooring, on the assumption that the wood of which it is to be composed would break with a load of 100 lb. hung on a piece of the material 1 inch square and 2 feet 6 inches span.

3. Sketch and describe any arrangement with which you are conversant for raising or lowering the teeth of a hay rake.

4. Define what is meant by a Rod of Brickwork.

5. Sketch and give dimensions and description of a sand-filter capable of dealing with 10,000 gallons per diem, and state rate of filtration you would suggest.

6. With reference to the above, describe the action of the filter and how you would arrange for its cleaning or maintenance.

7. How would you arrange a brake on the flywheel of a portable engine in order to test the power of same? Illustrate the arrangement by a sketch. What effective load should be applied to the brake to give 10 brake horse power, assuming the engine to run at 150 revolutions with a wheel 5 ft. diameter?

8. What would you specify as the tensile strength of W.I. and the transverse breaking strength of C.I.?

9. Sketch and describe an outward flow and inward flow turbine.

10. How do you define an electrical h.p.?

11. Describe a mole plough and the conditions under which it is used.

12. Sketch with dimensions a cast-iron hanging bracket and bearing for 2-in. shaft to be fixed to the underside of 6 in. × 9 in. wood joist.

EXAMINATION IN MENSURATION AND LAND SURVEYING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

(*Time allowed, three hours.*)

Not more than NINE of the following questions are to be answered. Numbers 2 and 3 must be attempted.

Candidates are required to show the calculations used to arrive at the answers.

---

1. (*a*) Find the cubic air space in a cow-shed of the following dimensions —length, 40 feet 3 inches; width, 16 feet 3 inches; height from floor to eaves, 10 feet 7 inches. Vertical height from floor to ridge, 17 feet 5 inches.

(*b*) How many cows would the shed hold, allowing not less than 800 cubic feet to each cow?

2. (*a*) From the field notes on page 2 [1] lay down the survey lines and plot the details to a scale of $\frac{1}{2500}$ (Ordnance).

(*b*) Ascertain by scaling and record the lengths of the tie or check lines, B X and D Y.[1]

3. (*a*) Plot the section from the reduced levels given on page 3.[1] Horizontal scale, 2 chains to an inch, and vertical scale, 20 feet to an inch.

(*b*) Using the levels found by "checking back," given on page 3,[1] ascertain the "error" in the set of levels.

4. Set out the field marked A on page 4 [1] in allotments, and in a similar manner to that shown in the sketch.

Each allotment to have an area of 40 poles, except Nos. 5, 6, 24, and 25.

Find by scaling the area of these four allotments which adjoin the side O P.

5. A ditch is required to be dug, the length of which is 16 chains 20 yards. For two-thirds of the length the slope of the sides is 1 to 1, and for the remainder 1 horizontal to $1\frac{1}{4}$ vertical. Depth of ditch 3 feet 9 inches; width at bottom, 1 foot.

(*a*) Find the number of cubic yards to be moved, and,

(*b*) Cost of same at 10*d.* per cubic yard.

6. A field containing 7 acres 3 roods 32 poles 22 yards was purchased for building purposes for 2,500*l.*

The field in shape is a rectangle, the two longer sides each measuring 660 feet.

Two parallel roads are required which run the whole length of the field, and two parallel cross roads at right angles to the longer ones. Width of roads, 40 feet.

Make a sketch of the field, and assuming the cost of the road-making and development to be 1,500*l.*, give the profit which would be made if the available land were sold in plots at 6*d.* per square foot.

7. Put the necessary construction and check lines which would enable you to make a correct survey of the dense wood drawn on page 4,[1] assuming you have only a chain, optical square and offset rod.

8. (*a*) Make a sketch showing dimensions and find the area (nearest pole only) of the following figure:

A B, 828 links, B C, 410 links, C D, 854 links, and D A, 630 links.

B C and A D are at right angles to A B—the figure is not to be plotted, the area being found by calculation only.

(*b*) Find the area of a circular pond, the perimeter of which is 176 yards.

9. A base line in a survey crosses a wide river at an angle of 45 degrees. Plot the lines you would use to ascertain the length between two points on the base line, one each side of the river.

10. (*a*) The area of a field on a map, the scale of which is 2 chains to an inch, is found by using a scale of 1 chain to the inch to be 12 acres 3 roods. What is the true area? Explain your answer by a small diagram or short explanation.

(*b*) What area would have been arrived at if a scale of 3 chains to the inch had been used instead of 1 chain to the inch?

11. (*a*) The parish scale, 25·344 inches to a mile, is sometimes denoted by $\frac{1}{2500}$.

What is the meaning of this? and show that the two are identical.

(*b*) What is the actual length of a line on the ground which is represented by $1\frac{3}{4}$ inches on this scale of Ordnance map?

(*c*) A field on the Ordnance map is stated to contain 32·881 acres.

Convert this into acres, roods, and perches.

12. Explain briefly the method to be adopted in using a theodolite:

(*a*) To map a ride in a wood which has many curves.

(*b*) To set out a long base line in a hilly country.

---

[1] Not here reproduced.

EXAMINATION IN GEOLOGY.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

(*Time allowed, three hours.*)

Not more than EIGHT of the following questions are to be answered, of which No. 12 must be one.

1. Enumerate twelve of the Elementary Substances that more especially enter into the composition of Minerals, and mention some of the Rocks of which they are severally important constituents.

2. Make a Table of *either* (1) the Secondary; *or* (2) The Tertiary Strata of England. Explain the meaning of the names you use; and enumerate some of the chief Fossils of the Formations you mention.

3. Enumerate some of the chief Fossils of the Upper Silurian and Permian Formations; and refer them to their Natural Orders.

4. How do you calculate the *depth* of *inclined strata* below the surface at a distance from the outcrop? Give both diagrams and formulæ.

5. Draw the section of a hill, one slope of which cuts the outcrops of alternate beds of clay and sand at a low angle; and explain how the natural drainage would affect (1) the fields occupying the hillside; (2) a road passing up the hill; and (3) a deep cutting along that road, made for laying Large Pipes to a Town at the foot of the hill.

6. Write a concise account of the different kinds of Soil. Of what are they composed? How did they originate? Where are they respectively met with? What is their relative agricultural value?

7. What was the nature and origin of the Mineral Manure which was known as "coprolite"? Where was it procured? What are other well-known kinds of Mineral Manure?

8. Enumerate the different Stony Materials most commonly used for making and mending Roads? Where are they got? Give your reasons for regarding some as better than others.

9. Give some account of the various kinds of Fossil Fuel; especially as to how they have originated, and where they are found.

10. Write a brief account of the Geology and Physical Geography of any one large County in England, Wales, Scotland, or Ireland. Give illustrative diagrams or sketches.

11. What districts in the British Isles yield the most (1) Metallic Ores, (2) Building-stone, (3) Slate, (4) Clay and Brick-earth?

12. Name and describe *four* of the specimens on the table.

EXAMINATION IN BOTANY.

FULL MARKS, 100. PASS, 50.

(*Time allowed, two hours.*)

Not more than EIGHT of the following questions are to be answered. Numbers 11 and 12 must be attempted.

1. Briefly explain diœcious, root-hair, callus, ovule, and ascus.

2. What adaptations do you know in plants to protect against drought, injury by animals, and non-fertilisation?

3. What is the difference between saprophyte and parasite, albuminous and exalbuminous, spore and seed?

4. What substances are necessary to form a nutritive solution which will by itself support a plant?

5. What would be the effect of excessive watering of plants kept in a moist atmosphere?

6. Why is copper sulphate used in spraying plants?

7. Why is rotation of crops advantageous?

8. Name, without description, what fungi are specially dangerous to wheat, clover, larch, and hollyhock.

9. What methods have been employed to obtain improved varieties of cultivated plants?

10. What is smut? Give its life-history.

11. Give the principal characteristics of one of the following Natural Orders:—*Cruciferæ*, *Leguminosæ*, or *Gramineæ*, and specify six of the plants of the Order that are cultivated in England.

12. Name and describe systematically the specimen provided.

EXAMINATION IN VETERINARY SCIENCE.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

(*Time allowed, two hours.*)

Not more than EIGHT of the following questions are to be answered. Nos. 1, 2, 3, 7 and 8 must be attempted.

1. Describe the structure of bone, cartilage, ligament, and tendon.

2. What are the chief uses of the above-named structures in the animal ody?

3. In examining the skeleton of a quadruped (horse or ox) what cavities are observed to be bounded more or less completely by bones?

4. What joints in man are represented by the stifle joints, hock joints, and knee joints of the horse?

5. How would you identify portions taken from each of the compartments of the stomach of an ox or sheep?

6. Describe the processes which result in the destructive changes which are always going on in the animal body, and state how the products are disposed of.

7. What constituents are required to form a perfect food?

8. How is the nitrogenous ratio of a food ascertained?

9. What parts do the carbohydrates and fats play in the process of nutrition?

10. What is the proportion of water in the tissues of the animal body, and how is it supplied and excreted?

11. Assuming that an ox and a sheep are to be kept for a time exclusively on roots, what quantity would each animal consume daily on an average?

12. Describe the dentition of a horse at two years and nine months, ox at two years, sheep at one year, and pig at fifteen months old.

EXAMINATION IN AGRICULTURAL ENTOMOLOGY.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

(*Time allowed, one hour and a half.*)

Not more than SIX questions are to be answered, of which the First must be one.

Where the candidate is not acquainted with the scientific name of an insect, the generally received English name will be accepted.

---

1. In what respects do insects differ from other groups of the Arthropoda? Draw a diagram of the dorsal aspect of a typical insect, naming the parts.

2. Give an account of the pests to which an oat crop is especially liable.

3. How are Dipterous larvæ as a rule distinguishable from Coleopterous larvæ? Describe carefully the larvæ of the following insects:—

Crane-fly (*Tipula*), Cockchafer, Currant saw-fly, Earwig.

4. Give the life-history of the horse bot-fly (*Gastrophilus equi*). Discuss the injury it inflicts, and suggest a method of treatment.

5. What crops are subject to attack from "root maggots" (larvæ of Anthomyiadæ)? Describe the injury done, and the best methods of dealing with these pests.

6. Explain, from your knowledge of the life-history of this group, the enormously rapid increase in a green-fly (*Aphis*) attack. Suggest a suitable "wash" for this pest, explaining the use of its ingredients.

7. Give an account of the various *wood-eating* pests to which fruit trees are subject.

8. Give an account of ONE of the two following Acarine pests, indicating the injury done, the crops attacked, and the methods of treatment:

(*a*) Red Spider (*Tetranychus telarius*).

(*b*) Currant Gall-mite (*Phytoptus ribis*).

Notes, Communications, and Reviews.

THE REPAIR OF FARM FOOTPATHS AND STILES.

THE recent decision of the Divisional Court in the case of Rundle *v.* Hearle [1] raises the question of the *ratione tenuræ* liability of farmers to repair the public footpaths and stiles upon their holdings. As the term implies, a liability to repair *ratione tenuræ* arises where a person is responsible for the maintenance of a highway "by reason of his tenure" of any lands. An individual may thus be liable to repair a highway if he hold land the tenants whereof have been immemorially accustomed to do so; for in such a case it will sometimes be presumed that the land was originally granted in consideration of such repairs being done.

It is difficult, however, to lay down any hard and fast rule upon the subject; the existence or non-existence of liability will depend upon the circumstances in each case. Thus, although the fact that a person has done repairs to a way may be some evidence of a liability to repair in the case of a road for carriages or horses, yet a footpath through fields and over stiles is a widely different matter. The one requires repairs on a system, and at certain intervals from the nature of the traffic, whilst the other does not necessarily do so, and, on the contrary, may never, except on isolated occasions, receive any repairs at all. It is quite possible that in dedicating a pathway through his fields the landowner may do so without any obligation to repair resting on himself or on anybody else. He merely dedicates a path on which people may pass if they choose to do so, but they take it as they find it, and subject to any condition which the owner imposes—such as the reservation of the right of ploughing, which is perfectly lawful, although all trace of the path is for the time being obliterated.[2] Moreover, the fact that a person has occasionally done small repairs to footpaths or stiles passing over his land, is quite consistent with the theory that such repairs were done by him merely for his own benefit and convenience, and is no evidence of any liability to repair. On the

[1] 67 L.J.Q.B. 741.

[2] Woodgate *v.* Mercer, 39 L.J.M.C. 21: L.R. 5 Q.B. 26.

other hand, if the repairs had been done outside such person's own land, or under threat of legal proceedings, or on notice from the parish or highway authority, or if they were admittedly done in the discharge of a legal obligation, a presumption of liability would be raised. Even this presumption, however, would often be capable of rebuttal, especially in the case of acts of repair outside the farmer's own fields, for it has been laid down that "an adjoining occupier occasionally doing repairs for his own convenience to go and come, is no more like that sort of repair which makes a man liable, *ratione tenuræ*, than the repair by an individual of a road close to his door is to the repair of the road outside his gate." [1]

These being the general principles, let us glance at their application in the litigation between Edwin Rundle and W. L. Hearle. The action was launched in the Truro County Court for damages for the non-repair of a stile, the plaintiff alleging that the defendant was liable, *ratione tenuræ*, to repair the stile, and that he, plaintiff, had suffered damage by its want of repair. From the recital of the facts by Lord Russell of Killowen, it appears that the defendant was the yearly tenant of a farm through which a public footpath ran. At one point in its course there was a stone stile with stone steps, some of which had been worn away by time and use. In crossing the stile the plaintiff slipped from one of these steps, fell, and broke his leg. He thereupon sued for damages, on the ground that the defendant, as occupier of the field, was liable, *ratione tenuræ*, to repair the stile, and that the plaintiff had suffered by its want of repair. The County Court Judge adopted this view, and awarded him damages.

There was evidence that the stile was at the time of the accident in the same state as it was in forty years ago, and it was denied that the defendant had ever repaired it. There was no evidence that the parish had ever repaired it, or had ever required the defendant or any prior occupier to do so, but there was evidence that the defendant's predecessor in possession, who was, however, proved also to be the owner, had done repairs to the path or stile. One witness, however, stated that previous occupiers had repaired, and another witness said that he had done some repairs whilst in the defendant's employ. As is usual in disputes in the County Court as to facts, there seems to have been a considerable conflict of evidence as to the repairs actually done, but the County Court Judge evidently accepted the plaintiff's version, and held that the plaintiff had established the defendant's liability to repair.

But the defendant appealed, contending that, even supposing the testimony given on plaintiff's behalf to be true, there was no evidence to support the finding of the County Court Judge that the defendant was liable to repair *ratione tenuræ*; that there was no evidence of any repairs other than those which the owners of the property for the time being would naturally execute for their own convenience. And the Lord Chief Justice and Mr. Justice Ridley,

[1] Rex *v.* Allanson, 1 Lewin, C.C. 158.

who heard the appeal, accepted this argument and overruled the County Court Judge, holding that there was not sufficient evidence to warrant him in coming to the conclusion at which he had arrived. They pointed out that the repairs alleged were inconsiderable and ambiguous, and could not be held to establish a liability on the part of the defendant.

Although it does not seem to have influenced the decision of either Court, it may be mentioned that the plaintiff in this particular instance was 67 years of age, and had had a "seizure" so far back as 1891. When the accident happened he was in a decrepit state, never having had the complete use of his legs since the seizure, and his medical attendant stated that he did not think it safe for him to cross the stile in question, which was a difficult one to negotiate. Apparently, therefore, the occurrence was due as much to the plaintiff's infirmities as to the defendant's neglect, and it would manifestly have been hard on the farmer had he been required to insure the safety of the lame and the halt as well as of the sound in limb.

As the Court held that there was no evidence of liability to repair, it became unnecessary to decide another interesting point arising in the same case—namely, whether (assuming liability) an action for damages will lie at the instance of a private person for breach of an obligation to repair *ratione tenuræ*? There appears to be no record of any such case in the books, and such authorities as there are seem to point in the opposite direction. Apparently the remedy is for the highway authority, after proper notice, to do the necessary repairs themselves, and charge the costs to the responsible party; or, if more cumbrous and expensive machinery be preferred, the offender could be prosecuted by indictment.

Notwithstanding the result of the appeal in Rundle *v.* Hearle, an enterprising plaintiff has more recently resorted to the Crewe County Court in an endeavour to fix a farmer with liability for injuries arising from a defective stile adjoining the highway. It was admitted that if the fence had been a division between two fields the question of liability could not arise; but it was contended that as the stile in this instance formed part of a fence which bounded the main road, it was repairable by the farmer, who was consequently responsible for any injury sustained by the persons using it. Unfortunately for this contention, however, an occupier of land is under no obligation at common law to fence against the highway, and apparently the only way in which such a liability could arise would be either from the state of the fence being so dangerous as to constitute a nuisance, or by virtue of an Inclosure Act or award or other statutory provision, of which there is no mention in the report of the case. The Judge held, therefore, that there was no obligation on the farmer to keep this particular stile in repair any more than the next stile in the field, for which it was admitted that he was not liable, and gave a verdict for the defendant, with costs.

It has already been noticed that there may in law be a dedication to the public of a right of way such as a footpath across a field,

subject to the right of the owner of the soil to plough it up in due course of husbandry and destroy all trace of it for the time. Care should, however, be taken in asserting this right, as its safe exercise depends upon immemorial usage, and a farmer would not be justified in ploughing out a path unless it had been the custom to do so as far as living memory went; and, moreover, it should only be claimed in the case of mere beaten tracks, as the formation or repair of a footpath with hard material would be inconsistent with the reservation of a right to plough it out.

Assuming the existence of a liability to repair, it extends not only to the path and stiles but to footboards over ditches, and where there is a public right of way it must not be obstructed by erecting gates or stiles, or fences where none existed before, nor by making existing stiles dangerous, nor by removing footbridges. Any person lawfully using the path who finds his course impeded by an unauthorised construction may remove it, being entitled to this extent to take the law into his own hands. On the other hand, the right of the public cannot be enlarged against the landowner without his consent, and he can therefore restrain the erection of more convenient or attractive stiles, or the substitution of hand gates to make the walk more popular.

By Section 13 (2) of the Local Government Act, 1894,[1] Parish Councils may, subject to restrictions as to their total expenditure, undertake the repair and maintenance of all or any of the public footpaths within their parish, not being footpaths at the side of a public road, but neither this power nor its exercise is to relieve any other authority or person from any liability with respect to such repair or maintenance. It will be noticed that this is a mere option, and does not impose any duty on the Parish Council to undertake the obligation, and they will probably not do so where there is no question that some individual is liable for the repair of the path. They will reflect that the electors will not countenance the relief of an individual at the expense of the community by lifting the onus of repair from private shoulders on to those of the ratepayers generally. It will only be in doubtful cases, or where there appears to be no liability at all, that Parish Councils will feel called upon to intervene; and even if they wish to exercise the powers conferred on them by the section, they may well be in doubt as to how far those powers extend. For instance, does the repair of footpaths include the maintenance of footbridges and stiles? Again, how are they going to repair the footpaths if they have no right to enter for that purpose on the adjoining lands? The section gives no right of entry in express words, and although it may be argued that the conferring the power implies the means to exercise it, it is by no means clear that they are entitled to enter on a man's land without his consent to put brick or other stuff on a footpath whenever they think proper—possibly carting the material through several fields over which there is a right of *footway* only. It has been suggested

[1] 56 & 57 Vic. c. 73.

that brick rubbish might be carried for the purpose in baskets to the spot requiring repair. What an alarming bill for labour would be presented if the scene of the repairs was some distance away and across several fields! This knotty point was submitted on behalf of the National Footpath Preservation Society to the Local Government Board, who very discreetly declined to express any opinion upon it. Let us recollect that it is merely a *power* which has been conferred. No *duty* is imposed, and the Legislature may have thought to itself "You must find out for yourselves how you are going to exercise it." The solution of the problem may be commended to the wisdom of the next Parish meeting!

A. E. BROMEHEAD SOULBY.

Malton, Yorks.

THE SALE OF FOREIGN AGRICULTURAL PRODUCE AS HOME PRODUCE.

IN view of the enormous importation of foreign agricultural produce into this country, and of the complaints that are constantly being made, not only by farmers, but very generally in all parts of the country, that many foreign goods are sold as home-made, the two following cases under the Merchandise Marks Act, 1887, are of interest.

This Act makes it an offence to sell goods to which a false trade description is applied, and by the expression "trade description" is meant a description, statement, or other indication, direct or indirect, as to (amongst other things) the place or country in which any goods were made or produced, and the word "goods" means anything which is the subject of trade, manufacture, or merchandise. In the cases [1] we are considering, an American ham was sold as a "Scotch ham," and it was decided, first, that a written description in the invoice of the ham as a Scotch ham, when, in fact, it was an American ham, was a false trade description within the Act, but that a mere oral statement to the same effect was not; and, secondly, that the master of the shop in which the ham was sold was liable for the acts of his servants in selling it under the false description, although he was not present, and although he had given orders that hams were not to be so sold.

The facts were as follow: John Moore, an inspector of the Bacon Curers' Association of Great Britain and Ireland, accompanied by a man named Ward, went to a shop called "The London Supply Stores" in George Street, Richmond, Surrey, which shop was one of several similar places of business carried on by H. W. Coppen in

[1] Coppen *v.* Moore (2 cases), reported in the Law Reports for the Queen's Bench Division of the High Court of Justice for the year 1898, vol. 2, pp. 300 to 315.

different localities, and asked one of Coppen's salesmen for a small English ham. The salesman pointed to a number of hams on a shelf outside the shop window and said, "Those are Scotch hams." Moore asked the price, and being told in reply $8\frac{1}{2}d.$ a pound, chose one of the hams, and the salesman passed it through the open shop window to an assistant named Wheeler and said, "Weigh up Scotch ham, $8\frac{1}{2}d.$" Wheeler did so, and said it came to $5s.\ 5\frac{1}{2}d.$ Moore then asked Wheeler to make him out an account for the ham, and to put on the account "Scotch ham," as he had bought it as such. Wheeler, however, handed Moore an invoice or bill without the word "Scotch" on it, but this Moore refused to take, and insisted on the insertion in it of the word "Scotch." Wheeler then inserted that word in the bill, and Moore paid him the $5s.\ 5\frac{1}{2}d.$ Moore then told Wheeler who he was, and asked him if he still said the ham was Scotch, and Wheeler said, "No, it's an American." The salesman was then called in, and admitted that the ham was American. The manager of the business, who was also called in, said the same, and added that the assistants had no right to sell the ham as "Scotch." From Moore's evidence it appeared that the ham in question was so dressed as to deceive the public, and that it was worth about 8*d.* per lb., while real Scotch hams would be worth about 1*s.* a lb. Coppen proved that he was not at the shop in Richmond on the day when the ham was sold, that he was the owner of six similar shops, in different places, and that some time previously to the day when the ham was sold he had sent notices to the managers of all his shops, including the one at Richmond, to the following effect :—

Most Important.

Please instruct your assistants most explicitly that the hams described in list as Breakfast hams must not be sold under any specific name of place of origin—that is to say, they must not be described as "Bristol," "Bath," "Wiltshire," or any such title, but simply as Breakfast hams.—Please sign and return, H. W. Coppen.

The manager of the Richmond business had received this notice, and communicated its contents to his assistants.

It was contended on behalf of Coppen that the Act does not apply to verbal statements of false trade descriptions; that, as the word "Scotch" was put on the invoice at Moore's request, no offence had been committed; and that, if any offence had been committed by Coppen's servants, Coppen himself was not responsible for it, because it had been committed in his absence and against his express instructions, and that he had taken all reasonable precautions against the commission of an offence against the Act. When the case came before the magistrates, they convicted one of the assistants of applying, and the other of causing to be applied, a false trade description to the ham, and the master (Coppen) of having unlawfully sold a ham to which a false trade description was applied, and they found that he had not taken all reasonable precautions against committing an offence against the Act. The

convictions of the two assistants were not disputed, but Coppen appealed from his own conviction on the grounds already stated, and the magistrates stated a case for the opinion of the High Court whether their decision was right in point of law.

The case was first argued before Mr. Justice Wright and Mr. Justice Darling, sitting as a Divisional Court, who decided the point as to the false trade description on the bill against Coppen; but the question whether he was liable for the acts of his servants, on account of its very great importance, was reserved for the decision of a special Court. This Court, which was subsequently formed of the following six judges—namely, the Lord Chief Justice of England (Lord Russell of Killowen), Sir F. H. Jeune (the President of the Probate, Divorce and Admiralty Division of the High Court), Lord Justice Chitty, and Justices Wright, Darling, and Channell—determined this point also against the appellant.

Judgment on the first point was given by Mr. Justice Wright to the following effect:—

"In my opinion the provisions of the Merchandise Marks Act, 1887, do not apply in the case of a trade description which is wholly verbal. The whole framework of the statute, with the exception of the provisions in section 20, relating to the false representation of goods made by a person holding a Royal Warrant, points to the necessity for a written or printed mark, or a physical mark in some other sense than a purely oral description. There is no decision nor even a suggestion to the contrary in any reported case, and I think that the section under which this case arises deals with marks and marks only. It is aimed at persons who sell or expose for sale or have in their possession for sale or any purpose of trade or manufacture goods or things to which a forged trade-mark or false trade description is applied, or to which any trade-mark or mark so nearly resembling a trade-mark as to be calculated to deceive is falsely applied; the language seems clearly to deal with the special cases of the employment of some visible or physical mark which is calculated to affect the sale of the goods, and not to apply to cases of mere verbal description. Where a merely verbal description is the subject of complaint, there is no reason why proceedings should not be taken under the Sale of Food and Drugs Acts, and we are in no way impairing the security given by the Legislature to the public in so holding. Then comes the question whether in the present case the description was anything more than verbal. I think there was a description in writing. Before the prosecutor (Moore) would consent to the property passing to him, he insisted that the trade description 'Scotch' must appear on the invoice, and the word was accordingly written by the assistant. There was, therefore, in my opinion, a sufficient trade description to satisfy the statute. The next point was that the appellant was exempt on the ground that he had taken all reasonable precautions against committing an offence against the Act; but on this point it is not open to us to question the finding of fact by the justices that he had not taken

all reasonable precautions. It cannot be expected that the justices should say what other precautions he ought to have taken; they evidently thought that the appellant was aware of the habit and practice of his servants. Then comes the question whether under this statute the employer can be punished for the unauthorised act of his servant. This raises so very important a question that I think it desirable that it should, with the sanction of the Lord Chief Justice, be argued before a special Court."

Accordingly this important point was argued before the special Court of six judges constituted as before stated, and they decided against the appellant.

The judgment of the Court was read by the Lord Chief Justice, who, after stating the facts of the case, proceeded as follows:—

"The question then comes to be narrowed to the simple point whether upon the true construction of the statute here in question, the master was intended to be made criminally responsible for acts done by his servants in contravention of the Act where such acts were done, as in this case, within the scope or in the course of their employment. In our judgment it was clearly the intention of the Legislature to make the master criminally liable for such acts, unless he was able to rebut the *primâ facie* presumption of guilt by one or other of the methods pointed out in the Act. Take the facts here, and apply the Act to them. To begin with, it cannot be doubted that the appellant sold the ham in question, although the transaction was carried out by his servants. In other words he was the seller, although not the actual salesman. It is clear also that the ham was sold with a 'false trade description,' which was material. If so, there is evidence establishing a *primâ facie* case of an offence against the Act having been committed by the appellant. But it is only a *primâ facie* case. The burden of proof is shifted upon the appellant, and he might meet successfully that *primâ facie* case if he is able, where the charge is under the first part of the section under the second part of which the present charge is made, to prove that he acted without intent to defraud; or where the charge is under the second part of that section, if he is able to prove (*a*) that he had taken all reasonable precautions against committing an offence against the Act, and had no reason to suspect the genuineness of the trade description in question; *and* (*b*) that on demand he had given full information; *or* (*c*) if he is able to prove that otherwise he had acted innocently. It seems clear that clauses (*a*) and (*b*) apply to cases where the goods in question are in the possession of the accused for sale or are sold with the forged trade-mark or false trade description already stamped upon them or otherwise applied to them, and not to a case like the present, where the false trade description is applied upon the occasion, and as part of the terms of sale; and in the latter case the accused must rely for his exculpation upon clause (*c*), namely, by showing that he had acted innocently. In the present case there was ample evidence to justify the conclusion of the magistrates that the appellant was *primâ facie* guilty of the offence charged, and that *primâ facie* case

has not been met in the manner required by the Act. The magistrates, indeed, have affirmatively found (in the terms of clause (*a*)) that the appellant had not, in fact, taken all reasonable precautions against committing an offence against the Act; but we have already pointed out that that clause does not directly apply to the facts of this case. This finding is therefore not strictly relevant, although it suggests an important element in determining whether the accused is innocent; but what is material to note is that the magistrates do not appear to have been asked to find, and certainly they do not, in fact, find, that the appellant had acted innocently within the meaning of clause (*c*). There was evidence before them that the American hams in question were dressed so as to deceive the public, and this probably explains the reason of the affirmative finding to which I have adverted, and the absence of the finding that the appellant had acted innocently within the meaning of clause (*c*). In answer then to the question which alone is put to us, namely, whether upon the facts stated, the decision of the magistrates convicting the appellant was in point of law correct, our answer is that in our judgment it was. When the scope and object of the Act are borne in mind, any other conclusion would, to a large extent, render the Act ineffective for its avowed purposes. The circumstances of the present case afford a convenient illustration of this. The appellant, under the style of the 'London Supply Stores,' carries on an extensive business as grocer and provision dealer, having, it appears, six shops or branch establishments, and having also a wholesale warehouse. It is obvious that, if sales with false trade descriptions could be carried out in these establishments with impunity so far as the principal is concerned, the Act would to a large extent be nugatory. We conceive the effect of the Act to be to make the master or principal liable criminally (as he is already by law civilly) for the acts of his agents and servants in all cases within the sections with which we are dealing where the conduct constituting the offence was pursued by such servants and agents within the scope or in the course of their employment, subject to this: that the master or principal may be relieved from criminal responsibility, where he can prove that he had acted in good faith, and had done all that it was reasonably possible to do to prevent the commission by his agents and servants of offences against the Act. The result therefore is that the conviction will be affirmed and with costs."

S. B. L. Druce.

Lincoln's Inn.

HAY HARVEST FORECASTS, 1898.

The results of the checking of the Hay Harvest Forecasts issued in 1898 by the Meteorological Office show that the general percentage of success for the entire country was 89, or 1 per cent. lower than in 1897. The largest percentage of success last year

in any district was 96 in England, S., but 90 per cent. and upwards was attained in several other English districts, as well as in Ireland, S. The smallest percentage of success was 76 in Ireland, N.

The telegrams were sent daily between 3.30 P.M. and 4 P.M. on each week-day for a period of about five weeks, the issue commencing in some of the southern districts on June 6, and extending to the other parts of the kingdom in the course of the ensuing five weeks.

SUMMARY OF RESULTS.

Districts	Names of Stations	Percentages: Complete success	Partial success	Partial failure	Complete failure	Sum of all successes, complete and partial
Scotland, N.	Golspie and Munlochy	46	40	12	2	86
Scotland, E.	Rothiemay, Glamis, and Aberfeldy	49	39	10	2	88
England, N.E.	Belford and Ulceby	58	30	11	1	88
England, E.	Norwich and Rothamsted	62	26	11	1	88
Midland Counties	Warwick, Cirencester, Much Wenlock, and Retford	68	18	12	2	86
England, S.	Maidstone, Downton, Reading, and Wye	68	28	3	1	96
Scotland, W.	Dumbarton, Ardwell, and Ellabus	51	41	8	—	92
England, N.W.	Knutsford and Leyburn	53	40	7	—	93
England, S.W.	Glastonbury, Clifton, and Tortworth	69	23	7	1	92
Ireland, N.	Edgeworthstown and Moynalty	57	19	21	3	76
Ireland, S.	Tralee and Thomastown	57	33	10	—	90
	Mean for all districts in 1898	58	31	10	1	89
	" " " in 1897	68	22	8	2	90
	" " " in 1896	59	29	10	2	88
	" " " in 1895	60	29	9	2	89
	" " " in 1894	61	28	10	1	89
	" " " in 1893	64	27	8	1	91
	" " " in 1892	56	32	10	2	88
	" " " in 1891	58	31	10	1	89

THE SPRING OF 1899.

THE weather of last spring was in many respects very similar to that experienced a year ago. The season opened, in the first place, with a cold dry March, the month proving, as in 1898, colder than either of the three winter months, December, January, or February. About the middle of the time there was a short burst of warmth, but this was followed by a sudden plunge into the weather of mid-

winter, severe frosts being experienced in all districts between March 18 and 25, with snowstorms of considerable severity at many places in the north-west, north, and east. In April the weather was, as in 1898, milder, but very changeable, the tendency throughout the whole month being for an excess of rain. May opened with fine dry weather, but after the first week there was a great change, and for about a fortnight rain fell almost every day, the amount being often large in the west and north. Later on the conditions became more settled, and at the close of the month a steady rise of temperature showed that spring was rapidly giving place to summer. Prior to this the farmer had reason to complain of a general absence of warmth, the growth of vegetation in the earlier and middle parts of May being decidedly sluggish. The change that set in at the close of the month was, however, so rapid, that matters soon showed a very material improvement, the agricultural prospects at the beginning of June being perhaps as favourable as in any recent year.

The leading features in the weather of the entire spring are shown in a statistical form on p. 403, the following remarks giving further details of interest in the history of each particular element.

Temperature.—In the early part of March the mean temperature over England was a little below the average, but in the third week there was a rather large excess of heat, while in the fourth there was a very great deficiency. April opened with mild weather, but the middle part of the month was cold, while at the close the temperature was again a little above the average. In May the variations were considerable, the only marked divergence from the normal being, however, in the fourth week, when the thermometer was decidedly low for the time of year. Taking the spring as a whole the mean temperature was below the average in all districts excepting the Channel Islands, the deficit being greatest in the midland and north-western counties. In the former district and also in the south-west the deficiency of warmth appears to have been about the same in the daytime as at night, but in the eastern and north-western counties the day temperatures showed by far the larger deficit. In the north-east the cold was, on the other hand, much greater by night than by day, while in the Channel Islands a very slight deficiency of warmth was shown in the night readings, and an actual excess in the daytime. The variations in the distribution of the cold were in fact very peculiar, and their effect upon the growth of vegetation must have led to very different results in different parts of the country. A comparison with the state of things prevailing in recent years shows that at many places in the northern and central parts of the country the spring was colder than either of its five immediate predecessors. In the eastern and southern districts, however, it was a trifle warmer than last year. The highest temperatures of the past season occurred as a rule on either May 11 or May 18, when the thermometer rose to between 69° and 72° in most districts, but to only 66° in the Channel Islands and 64° in the north-western counties. It is right to add,

Temperature, Rainfall, *and* **Bright Sunshine** *experienced over* **England** *and* **Wales** *during the Thirteen Weeks ended May* 27, 1899.

(*The Spring Season*)

Districts	Temperature							
	Highest observed	Lowest observed	Day temperatures		Night temperatures		Day and night temperatures combined	
			Mean	Difference from average	Mean	Difference from average	Mean	Difference from average
	°	°	°	°	°	°	°	°
North-eastern counties	69	20	50·5	−0·3	37·0	−1·6	43·8	−0·9
Eastern counties	71	11	52·7	−1·2	37·4	−0·7	45·1	−0·9
Midland "	69	16	53·2	−1·4	36·6	−1·1	44·9	−1·3
Southern "	72	17	53·5	−1·0	39·2	−0·9	46·4	−0·9
North-western counties, including North Wales	64	20	51·1	−1·7	39·3	−0·6	45·2	−1·2
South-western counties, including South Wales	69	13	52·9	−0·6	40·3	−0·7	46·6	−0·7
Channel Islands	66	29	54·3	+0·6	44·2	−0·2	49·3	+0·2

Districts	Rainfall				Bright Sunshine			
	Days with rain		Total fall		Duration		Percentage of possible amount	
	Number	Difference from average	Amount	Proportion of average amount	Hours recorded	Difference from average	Percentage	Difference from average percentage
			ins.	per cent.				
North-eastern counties	52	+ 7	6·9	128	368	−29	30	−2
Eastern counties	44	+ 2	5·6	111	466	− 2	38	0
Midland "	43	+ 3	5·4	98	435	+ 4	36	+1
Southern "	35	− 4	4·5	82	491	+20	40	+1
North-western counties, including North Wales	53	+10	7·9	129	428	+24	35	+2
South-western counties, including South Wales	50	+ 8	7·7	106	487	−12	40	−1
Channel Islands	46	0	5·6	91	572	+20	47	+1

NOTE.—The above Table is compiled from information given in the Weekly Weather Report of the Meteorological Office. The averages employed are: For Temperature, the records made during the twenty-five years, 1871–95; for Rainy Days, the values for the fifteen years, 1881–95; for Total Rainfall, those for the thirty years, 1866–95; and for Bright Sunshine, those for the fifteen years, 1881–95.

however, that this remark applies only to the period embraced by our table; in many districts the heat at the very end of May was somewhat greater than at any previous time, the shade maxima on the 31st being as high as 75° at some of the central stations. Including, however, these readings we find that the extreme warmth of the spring season compared unfavourably with that of recent years, and especially with the years 1895 and 1896. In the former of these seasons the thermometer at the close of May rose to 80° and upwards in most districts, to 85° in the southern, and to 87° in the eastern counties: the readings being, therefore, at least ten degrees higher than anything observed last spring. The lowest temperatures of the past season occurred very generally between March 21 and 24, when the thermometer fell to 20° or less in all districts excepting the Channel Islands, to 15° at Cullompton (Devon), 13° at Llandovery (Caermarthenshire), and 11° at Geldeston, near Beccles. Over the kingdom generally the frost experienced at this time was not only sharper than in any of the five preceding springs, but was more severe than anything recorded during the previous winter. In addition to the cold weather at the end of March occasional sharp touches of frost were experienced in the early part of that month, and slight frosts at various other times in the season. In the north-eastern counties there was during the whole quarter only one week, and in the midland counties only two weeks, with an entire absence of frost—a very unusual occurrence in the springtime.

Rainfall.—March proved a very dry month, especially in the southern parts of the country, where the total amount of rain was considerably less than half the average. Throughout the remainder of the season the tendency was for an excess of rain, the only important exception being in the first week in May, when the weather was again very dry. The wettest week of all was the second in April, when the rainfall over the country generally amounted to more than twice as much as the normal. Taking the season as a whole, we find that in the western, northern, and eastern parts of the country the total rainfall was more than the average, the excess being large in the two northern districts (the north-eastern and the north-western). In the midlands there was a slight deficiency, and in the Channel Islands a larger deficiency, while in the southern counties the rainfall amounted to only 82 per cent. of the average. In the north-east and east the spring proved wetter than in either of the five preceding years, and in the north-west it was the wettest of the series, with the exception of 1897. In other parts of the country, however, it was drier than in 1898, and in some places it was also drier than in 1894. The number of days with rain was greater than the average in all districts excepting the Channel Islands, where it was exactly equal to the normal, and the southern counties, where there was a slight deficiency. In the west and north the excess was rather considerable, but over the country generally there were not so many days with rain as in the spring of 1897. During the past season heavy individual falls of rain were rare, the principal cases being (1) on

March 25 in the north-west of England, when 1·5 inch was measured at Stonyhurst; (2) on April 9, in the western districts generally, the fall amounting to 1·2 inch at Douglas (Isle of Man); (3) on May 12, when a heavy storm of rain and hail at Cirencester yielded a similar amount; (4) on May 19, again in the west, the largest amount recorded being 1·3 inch at Douglas and Tavistock. Snow or sleet occurred principally on the following dates: (1) On March 4 at some of the northern and central stations, and on March 9 at scattered places in the west and north; (2) between March 18 and 25, and in all districts, the fall being heavy in many parts of Wales and the north and east of England (at Norwich on the 19th it lay to a depth of 8 inches), but slight in the extreme southern counties; (3) on April 8, and again on the 11th, in isolated parts of the country; (4) on April 13 in the northern counties; and (5) on April 16 and 17 in the north and east of England. Thunderstorms, or thunder only, occurred with unusual frequency in April and May, but the phenomena were in many cases purely local. The more general storms were experienced: On April 13 in the north of England, and on the following day in our south-western counties; on April 29 in the north of England; on May 9 in North Wales and the north-west of England; on May 11 and 12 over nearly the whole of our south-western, southern, and south-eastern counties; on May 15 and 16 in many isolated parts of the country; on May 20 in the eastern and midland districts, and on May 23 in several isolated places.

Bright Sunshine.—In March the duration of bright sunshine was usually in excess of the average, the first week being especially bright. Throughout the remainder of the season the tendency was all in the opposite direction, the only really sunny weeks being the third in April and the first in May. The results for the season as a whole showed no very great divergence from the normal. In the eastern and midland counties there was, in fact, no appreciable difference, but in the north-eastern and the south-western districts there was a slight deficiency. In the southern counties, and also in the Channel Islands and the north-western district, there was a trifling excess. In all but the western parts of the country the spring proved more sunny than in 1898, and in the eastern and southern counties it was brighter than in 1896. As a rule, however, it was less sunny than in 1897, 1895, or 1894.

CROPS AND LIVE-STOCK IN 1898.

Preliminary instalments of the Agricultural returns for the year 1898 have appeared in tabular form in the Journal, at pp. 578 and 806 of last year's volume (1898), and at p. 214 of this volume (Part I.). These, with other details, are embodied in the summary table given herewith at pp. 406 and 407, which is compiled from the complete

Estimated Total Produce and Yield per Acre of the Principal Crops, Cattle, Sheep, *and* Pigs, *in the United*

[*Compiled from the*

Crops	England: Acreage, 'thousands' (000) omitted		England: Produce of crops, 'thousands' (000) omitted		England: Average yield per acre		Wales: Acreage, 'thousands' (000) omitted		Wales: Produce of crops, 'thousands' (000) omitted		Wales: Average yield per acre	
	1897	1898	1897	1898	1897	1898	1897	1898	1897	1898	1897	1898
CORN CROPS:—	Acres	Acres	Bush.	Bush.	Bush.	Bush.	Acres	Acres	Bush.	Bush.	Bush.	Bush.
Wheat	1,786	1,987	51,725	69,074	28·97	34·76	54	59	1,332	1,582	24·76	26·83
Barley, including Bere	1,698	1,563	55,159	55,378	32·48	35·44	104	103	3,116	3,377	29·86	32·82
Oats	1,829	1,731	73,639	75,283	40·26	43·49	239	231	7,766	8,390	32·56	36·37
Beans	214	217	6,123	6,692	28·71	30·83	1	1	30	36	20·74	28·25
Peas	187	173	5,168	4,782	27·64	27·69	2	2	35	34	20·35	21·87
TOTAL CORN CROPS (including Rye)	5,781	5,731	—	—	—	—	402	397	—	—	—	—
GREEN CROPS:—			Tons	Tons	Tons	Tons			Tons	Tons	Tons	Tons
Potatoes	352	365	1,896	2,256	5·38	6·17	33	33	166	184	5·10	5·62
Turnips, including Swedes	1,288	1,237	17,106	13,083	13·28	10·58	70	68	1,114	1,011	15·84	14·84
Mangel	345	343	6,480	6,064	18·76	17·68	8	8	126	129	16·07	16·39
Cabbage, Kohl-rabi, and Rape	151	150	—	—	—	—	3	3	—	—	—	—
Vetches or Tares	187	182	—	—	—	—	2	2	—	—	—	—
Other Green Crops	127	121	—	—	—	—	1	1	—	—	—	—
TOTAL GREEN CROPS	2,450	2,399	—	—	—	—	117	115	—	—	—	—
OTHER CROPS, GRASS, &c.:—			Cwt.	Cwt.	Cwt.	Cwt.			Cwt.	Cwt.		
Clover and artificial grasses and permanent pasture	10,483	10,465	—	—	—	—	1,634	1,630	—	—	—	—
Ditto for hay	5,594	5,712	147,930	178,334	—	—	670	674	14,529	16,674	—	—
Flax	1	1	—	—	—	—	—	—	—	—	—	—
Hops	51	50	411	357	8·08	7·17	—	—	—	—	—	—
Small Fruit[a]	64	63	—	—	—	—	1	1	—	—	—	—
TOTAL OTHER CROPS	16,193	16,291	—	—	—	—	2,305	2,305	—	—	—	—

Live Stock	England: Year 1897	England: Year 1898	Wales: Year 1897	Wales: Year 1898
	Actual No.	Actual No.	Actual No.	Actual No.
Horses	1,168,763	1,163,625	153,282	151,954
Cattle	4,567,834	4,674,303	709,120	701,777
Sheep	15,721,213	15,886,538	3,195,359	3,268,708
Pigs	1,990,534	2,078,898	216,447	238,581

NOTE.—The produce of Corn Crops for Ireland, originally returned in weight, has been converted into *bushels* at the rate of 60 *lb.* to the bushel of Wheat; 50 *lb.* to the bushel of Barley; 39 *lb.* to the bushel of Oats; and 60 *lb.* to the bushel of Beans and Peas.

and also the Acreage under Other Crops *and* Grass, *and Numbers of* Horses,
Kingdom in the Years 1897 *and* 1898.
Agricultural Returns.]

Scotland						Ireland						United Kingdom[4]					
Acreage, 'thousands' (000) omitted		Produce of crops, 'thousands' (000) omitted		Average yield per acre		Acreage, 'thousands' (000) omitted		Produce of crops, 'thousands' (000) omitted		Average yield per acre		Acreage, 'thousands' (000) omitted		Produce of crops, 'thousands' (000) omitted		Average yield per acre	
1897	1898	1897	1898	1897	1898	1897	1898	1897	1898	1897	1898	1897	1898	1897	1898	1897	1898
Acres	Acres	Bush.	Bush.	Bush.	Bush.	Acres	Acres	Bush.	Bush.	Bush.	Bush.	Acres	Acres	Bush.	Bush.	Bush	Bush
50	56	1,883	2,372	37·83	42·47	47	53	1,355	1,858	28·69	35·16	1,939	2,158	56,296	74,885	29·07	34·75
233	238	8,539	9,297	36·63	39·07	171	158	5,799	6,679	33·98	42·23	2,214	2,069	72,613	74,731	32·91	36·24
968	956	35,442	35,248	36·60	36·87	1,175	1,165	46,709	53,657	39·75	46·04	4,226	4,038	163,556	172,578	38·84	42·27
14	13	449	471	32·30	35·26	1	2	47	67	34·49	38·92	230	234	6,650	7,267	28·91	31·13
2	1	36	32	24·96	25·47	½	½	10	9	23·72	21·84	191	177	5,250	4,858	27·55	27·60
1,274	1,271	—	—	—	—	1,408	1,391	—	—	—	—	8,890	8,817	—	—	—	—
		Tons	Tons	Tons	Tons			Tons	Tons	Tons	Tons			Tons	Tons	Tons	Tons
120	126	546	842	4·55	6·66	678	665	1,498	2,942	2·21	4·43	1,194	1,201	4,107	6,225	3·47	5·23
475	467	7,432	7,242	15·64	15·50	309	307	4,134	5,163	13·38	16·82	2,150	2,087	29,785	26,499	13·90	12·74
1	1	22	26	16·04	18·04	54	[1] 56	751	1,010	13·74	18·04	410	409	7,379	7,228	18·03	17·71
12	12	—	—	—	—	46	[2] 49	—	—	—	—	213	215	—	—	—	—
11	10	—	—	—	—	4	3	—	—	—	—	204	197	—	—	—	—
2	2	—	—	—	—	24	25	—	—	—	—	157	151	—	—	—	—
622	620	—	—	—	—	1,115	1,105	—	—	—	—	4,328	4,261	—	—	—	—
		Cwt.	Cwt.					Cwt.	Cwt.					Cwt.	Cwt.	Cwt.	Cwt.
2,453	2,457	—	—	—	—	10,459	10,470	—	—	—	—	25,084	25,077	—	—	—	—
532	532	16,638	17,752	—	—	2,177	2,174	101,758	105,552	—	—	8,993	9,113	280,854	318,313	—	—
—	—	—	—	—	—	46	34	—	—	—	—	47	35	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	51	50	411	357	8·08	7·17
5	5	—	—	—	—	—	—	—	—	—	—	70	70	—	—	—	—
2,990	2,994	—	—	—	—	12,682	12,678	—	—	—	—	34,245	34,345	—	—	—	—

Year 1897	Year 1898	Year 1897	Year 1898	Year 1897	Year 1898
Actual No. 204,379	Actual No. 201,581	Actual No. 534,133	Actual No. 513,788	Actual No. 2,069,852	Actual No. 2,040,330
1,223,543	1,246,284	4,463,935	4,486,242	11,004,034	11,149,212
7,423,868	7,587,948	4,157,581	4,287,274	30,567,061	31,102,359
135,321	134,116	1,327,226	1,253,682	3,682,819	3,719,219

[1] Including Beetroot. [2] Cabbage and rape only. [3] Gooseberries, strawberries, currants, and other small fruit.
[4] Including (under Acreage) Isle of Man and Channel Islands.

returns[1] that were published on June 5, 1898. This table may be consulted in conjunction with the following observations derived from Major Craigie's report prefixed to the official volume.

Produce of Crops in Great Britain in 1898.

The Year's Productiveness.—The returns of the estimated produce of the crops of Great Britain are conclusive as to the unusually productive character of the year 1898. Despite some local variations, the bountiful results of the season were apparent in a greater or less degree in the case of every enumerated crop, with the exception of the turnips and hops of the English counties.

The Weather of 1898.—The relative productiveness of a particular season depends so largely on its meteorological characteristics that it may be of interest to note briefly some of the salient features of the weather of 1898, so far as these are reflected in the records of observations published by the Meteorological Office. From these it appears that the mean rainfall of the year was 30·9 inches, as compared with a thirty-three years' average of 34·4 inches, and the mean temperature 50 degrees, as compared with an average of 48·5 degrees Fahrenheit. The mean rainfall in 1898 was the lowest recorded since 1893, while the mean temperature was exceptionally high. There were, however, wide divergencies in the local records of rainfall. In the North of Scotland, for example, the year was exceptionally wet, while in the West of Scotland also the rainfall exceeded the average. On the other hand, in the East of England the rainfall during the year amounted to only 20·3 inches, and in the Southern counties to 21·7 inches, being five inches and seven inches respectively less than the average for those districts.

The weather of January was dull, dry, and warm, the mean temperature at many of the northern stations being the highest on record for the time of year. Wheat and other autumn-sown crops, having been put into the land under very propitious conditions, came forward with unusual luxuriance during the mild weather which obtained until the middle of February. During the latter part of that month and throughout March the weather was changeable, but generally cold, and vegetation received a wholesome check. In fact the spring, although favourable for working the land, was a backward one, April being dry and May cold and wet. The weather of June was changeable and showery, with occasional thunderstorms, while that of July was mostly fair and dry, until the close of the month, when it became less settled. During August the weather was generally fair, warm, and dry in the Southern and South-eastern districts, but unsettled in the West and North; and September over the greater part of the country—and especially in the Eastern half of England—was very dry, with bright

[1] *Agricultural Returns for Great Britain, showing the Acreage and Produce of Crops, Prices of Corn, and Number of Live Stock, with Agricultural Statistics for the United Kingdom, British Possessions, and Foreign Countries*, 1898 [C.—9304], pp. liv and 264. London: Eyre & Spottiswoode. 1*s.* 5*d.*

sunshine far in excess of the average for the month. These conditions prevailed until the middle of October, when the drought broke up with gales and heavy rains. In November and December the weather, notwithstanding stormy intervals, was generally mild and favourable for farming operations.

Yield of Crops in 1898.—A convenient method of showing the comparative yield of the principal crops of 1898 in Great Britain appears in Table I., in which the average of the estimated yields of wheat, barley, oats, potatoes, turnips, and hay, for the ten years 1888–97 inclusive, is represented by 100 in each case, and the result of each harvest during that period, with the addition of 1898, is shown in relation to that standard.

TABLE I.—*Comparison of Estimated Yields per Acre for* 1898 *in Great Britain with Estimated Yields of former Years.*

Year	WHEAT	BARLEY	OATS	POTATOES	TURNIPS and SWEDES	HAY (Clover)	HAY (Permanent grass)
	Average 1888-97, 29·19 bushels per acre =100	Average 1888-97, 32·97 bushels per acre =100	Average 1888-97, 38·51 bushels per acre =100	Average 1888-97, 5·85 tons per acre =100	Average 1888-97, 13·50 tons per acre =100	Average 1888-97, 27·76 cwts. per acre =100	Average 1888-97, 22·95 cwts. per acre =100
1888	96	100	97	89	94	101	123
1889	102	96	102	106	108	121	127
1890	105	106	108	91	106	110	116
1891	107	104	101	98	98	103	102
1892	90	105	101	99	105	92	83
1893	89	87	92	113	99	68	55
1894	105	105	108	95	100	117	125
1895	90	96	96	114	96	97	83
1896	115	102	96	108	91	87	76
1897	100	100	100	88	104	105	109
1898	119	108	106	107	89	121	127

It will be seen that the hay crop, both from seeds and meadow, was relatively the best of the year, exceeding the average, as in 1889, by 21 and 27 per cent. respectively. Wheat yielded 19 per cent. above the decennial average, barley 8 per cent., potatoes 7 per cent., and oats 6 per cent., turnips and swedes forming a notable exception with 11 per cent. below the average.

Estimated Yield of Wheat in Great Britain.—The estimated total produce of wheat grown in Great Britain in 1898 was 9,129,000 quarters, a greater quantity than has been returned in any year since 1890, when the acreage under this crop was 284,000 acres larger than the 2,102,000 acres under this cereal in 1898. Compared with the exceptional year of minimum produce, 1895, in which, on an extraordinarily reduced area, coincident with an indifferent yield, the whole crop amounted to only 4,647,032 quarters, it will be seen that the available supply of native wheat was almost

doubled. The yield per acre in 1898 for the whole country was 34·74 bushels, or an excess of 5·55 bushels above the average of the ten years 1888–97. This indicates a larger yield than in any previous year since the Produce Returns were first collected in 1884. It may be added that, although no official data exist to show what were the wheat yields of still earlier years, a frequently quoted estimate published by Sir John Lawes, and going back to 1852, indicated a greater yield in Great Britain only in the three seasons of 1854, 1863, and 1864.

The normal variations in the yield of wheat in different counties of England show a range of 12 bushels per acre between the highest and the lowest, and in 1898 there was still wider diversity. The county showing the largest crop was, as is commonly the case, Lincoln, which returned an average of 38·59 bushels per acre, while at the other end of the scale among English counties was Monmouth with a yield of only 25·72 bushels. In several individual counties the average yield of 1898 was not, as in the case of Great Britain, the highest recorded. Thus even in Lincolnshire itself the wheat yield of 1898 was exceeded by more than two bushels per acre in the county average reported in 1896; and in the adjoining area of the East Riding of Yorkshire the yield of last year was considerably below that of both 1887 and 1896. Again, in Kent, the yield of last year has been three times exceeded since 1884, and in Leicester and Warwick twice, while in Monmouth, where the yield, as already shown, did not reach 26 bushels per acre, the crop of 1898 had been no fewer than five times exceeded within the preceding thirteen years.

Estimated Yield of Barley in Great Britain.—The yield of 35·75 bushels per acre at which the barley crop of Great Britain was estimated was, as in the case of wheat, larger than in any previous year in the period of official record, although this figure was closely approached in 1885, when a crop of 35·11 bushels was returned.

The English counties showing the highest yields of barley in 1898 were Kent, Lancaster, and Northumberland. The division comprising the Northern counties stood well above the estimate for the rest of England, and the Scottish yield of barley in 1898 is still more largely in excess, the heaviest crops being recorded in Linlithgow, Edinburgh, and Haddington.

Estimated Yield of Oats in Great Britain.—Oats were estimated to have shown an average for Great Britain as a whole of 40·76 bushels per acre, a result which was only exceeded in 1890 and 1894 during the past fourteen years. Lincolnshire maintained its high standard with a crop of over 54 bushels per acre, but Norfolk, with a crop of 53 bushels, showed a relatively better result for the year, being as much as 7 bushels in excess of the normal standard of the county.

Estimated Yield of Potatoes in Great Britain.—Potatoes, with an average yield of $6\frac{1}{4}$ tons per acre, were about 8 cwts. above an average in Great Britain as a whole. This, however, was largely attributable to Scotland, where a crop exceeding the average by over one ton per acre was lifted. In England alone the results were

not more than one-fifth of a ton above the average. In the Scottish figures the estimates from different counties are very various.

Estimated Yield of Roots in Great Britain.—The average yield of 12·04 tons per acre of turnips in Great Britain, showing a deficiency of nearly $1\frac{1}{3}$ tons less than the average, only partially discloses the result. In Scotland, where one-fourth of the turnip land is situate, the crop was a good one, a yield of half a ton per acre above the average being estimated. In England, however, the yield was only 10·58 tons, or 2·31 tons less than average. Nor was this deficiency at all equally distributed. The counties in which it was most marked were Wiltshire with 7·61, Somerset 5·91, Hampshire and Worcester 5·73, Bucks 5·71, Berkshire 5·58, and Dorset 4·57 tons below the local average. The group of counties lying south of the Thames, particularly those which are largely devoted to sheep-breeding, and where the turnip crop is therefore of special importance, were the most unfortunate in this respect.

Mangels, though yielding less by a ton per acre than in 1897, exceeded the decennial average by some 6 cwts. Shropshire, among the English counties, returned the largest crop of the year—nearly 26 tons per acre—and Durham the smallest—12·80 tons per acre.

Estimated Yield of Hay in Great Britain.—It has been already observed that, of all the crops for which returns of yield are collected, hay stood highest in 1898, a fact which is the more remarkable in a year when in many districts second cuts and aftermath were admittedly short. Table I. (p. 409) also indicates that the hay crop of both kinds in 1898 exceeded the average to about the same extent as in 1889. Examining the figures more minutely, it is found that in both instances there was a slight excess last year over the actual yield of 1889, so that the crop of 1898 may fairly claim to be the best on record. The total estimated production of hay, 10,638,000 tons, fell, however, below the aggregate of 1889, when it reached 11,431,000 tons, the area mown in that year being more than half a million acres greater.

The estimated yield of clover hay in Great Britain was 33·65 cwts. per acre. In this case, however, the English and Scottish results approximate very closely with 34·09 and 34·21 cwts. respectively, the average for the whole country being slightly reduced by the lower estimate for Wales. In Cornwall and Devon in the West, and in Westmorland and Cumberland in the North, crops exceeding the local average by from 10 to 13 cwts. per acre were returned; and in Scotland, Linlithgow and Edinburgh showed equally good results. The general excellence of the yield may be gathered from the fact that in only one English county did it fall below one and a quarter ton per acre.

Hay from permanent grass was estimated to yield a crop averaging 29·24 cwts. per acre for Great Britain, being, as previously shown, no less than 27 per cent. above an average, and slightly exceeding the crop of 1889, which was previously the heaviest recorded. As in the case of clover hay, Westmorland and

Cumberland head the list of the English counties; and in Scotland, Renfrew, Lanark, and Dumbarton had the heaviest yield.

Crops of the United Kingdom.

So far attention has been confined to the harvest in Great Britain, but by including the figures for Ireland (which, in that country, are supplied by the Registrar-General), a general view may be obtained, so far as the chief crops are concerned, of the results for the United Kingdom. Table II. also directs attention to the relative bulk of the three great cereals.

Table II.—*Estimated Total Produce of Crops in the United Kingdom.*

Crops	1896	1897	1898
	quarters	quarters	quarters
Oats	20,357,000	20,445,000	21,572,000
Barley	9,728,000	9,077,000	9,341,000
Wheat	7,281,000	7,037,000	9,361,000
	tons	tons	tons
Potatoes	6,263,000	4,107,000	6,225,000
Turnips	28,037,000	29,785,000	26,499,000
Mangel	5,875,000	7,379,000	7,228,000
Hay (all sorts) . . .	11,416,000	14,043,000	15,916,000

Live-stock in Great Britain.

Horses.—Turning next to the live-stock enumerated in 1898, it will be observed that the slight decline noticed in the number of horses in 1897 has been followed by a further but less significant drop in 1898. The decline appears in the "unbroken" class, which until 1896 had shown a continuous advance, associated with the greater attention directed to the breeding of horses in this country. The decrease now shown in the category of unbroken horses is most marked among those not exceeding one year old, and must be held to indicate a further check in the expansion of horse-breeding previously noted. The counties showing the greatest additions in 1898 to the number of agricultural horses other than unbroken, are Lincoln, Cornwall, and Derby, the Scottish counties, on balance, showing fewer horses.

Cattle.—The figures for cattle in 1898 are more satisfactory than those for horses, the total for Great Britain showing an increase of 122,000 over the figures for 1897, which had exhibited an increase of less than 7,000 on the preceding year. Every English county except Devon, Cornwall, and Middlesex contributed in 1898 to the increase, which in some counties, such as Norfolk, Suffolk, Somerset, Lancaster, and Essex, reached considerable proportions. On the other hand, nine out of the twelve Welsh counties return fewer cattle than in 1897, the falling off shown being chiefly among yearling stock. Perhaps the most satisfactory

feature of the year's returns of cattle was the augmentation of the number of young stock under one year old, noticeable in the English and Welsh breeding counties. The cow stock of the country is again at a level higher than in any year since 1892, although both in the aggregate, and still more in relation to the population, even after the present recovery, the numbers of cows and heifers in milk or in calf fall short of those returned in 1892 and 1891. The addition in the past year to the cows and heifers in Great Britain amounted to 2·2 per cent., and that of other cattle over two years to 4·4 per cent.

Looking backward, however, over a longer series of years, and summarising, as in Table III., the cattle returns of Great Britain since 1871, the increase in the number, whether of cows or of other cattle, has not, it will be observed, been commensurate with the increase of population.

TABLE III.—*Numbers of Cattle in Great Britain.*

Period		Population of Great Britain	Cows and heifers in milk or in calf	Other cattle	Proportion of cows to 1,000 persons	Proportion of other cattle to 1,000 persons
		No.	No.	No.	No.	No.
Averages	1871–75	26,854,217	2,204,000	3,609,000	82	134
	1876–80	28,666,150	2,228,000	3,582,000	78	125
	1881–85	30,429,380	2,353,000	3,756,000	77	123
	1886–90	32,083,604	2,499,000	3,854,000	78	120
	1891–95	33,823,120	2,562,000	4,078,000	76	121
Year	1896	34,904,204	2,512,000	3,982,000	72	114
,,	1897	35,273,634	2,532,000	3,968,000	72	112
,,	1898	35,647,024	2,587,000	4,035,000	73	113

Even the recovery recorded in 1898 fails, it will be seen, to replace the numbers per 1,000 of the population at the level shown in the earlier years—a fact which is to be borne in mind as helping to explain the growing imports both of dairy produce and of beef.

Sheep.—The sheep of Great Britain more than recovered in 1898 the decline shown in 1897. About one-third of the increase of 403,000 was due to an augmentation of the breeding ewes, and about two-thirds to an addition to the number of lambs living on June 4. The total sheep stock is, however, still under that of the year 1893, and less by 2,000,000 than the number returned in the two immediately preceding years, though the latest figures, it may be recalled, represent flocks larger by more than 1,000,000 than the average shown for Great Britain for the decade 1881–90.

Since 1895 there has been, as shown in Table IV., p. 414, a yearly increase in the number of ewes kept for breeding, in spite of variations in the returns of other sheep.

TABLE IV.—*Numbers of Sheep in Great Britain.*

Year	Ewes kept for breeding	Other sheep of one year and above	Total of ewes and sheep one year old and above	Lambs	Total of sheep and lambs
1893	10,129,000	6,911,000	17,040,000	10,241,000	27,281,000
1894	9,668,000	6,343,000	16,011,000	9,851,000	25,862,000
1895	9,663,000	6,334,000	15,997,000	9,795,000	25,792,000
1896	9,926,000	6,428,000	16,354,000	10,352,000	26,706,000
1897	10,007,000	6,219,000	16,226,000	10,115,000	26,341,000
1898	10,138,000	6,204,000	16,342,000	10,401,000	26,743,000

So far as the number of lambs returned in June may be taken as an index to the number born, it would appear that the lambing season of 1898 was a successful one, although, relatively to the number of ewes, the fall of lambs was not so great as in 1896. Thus for every 1,000 ewes returned there were, in June 1896, 1,043, and in June 1898, 1,026 lambs.

Considerable local variations are shown in the returns for sheep, Cumberland exhibiting an increase of 5 per cent. on the previous season, while Surrey showed a decline of 9 per cent. In Scotland the proportionate rate of increase in the number of sheep on the year was about double that of England.

Pigs.—The great reduction in the number of pigs referred to in last year's report was only partially recovered by an increase of 109,000 in those recorded in 1898. Table V. shows the fluctuations which have taken place since 1893, when the number returned was unusually small.

TABLE V.—*Numbers of Pigs in Great Britain.*

Year	Sows kept for breeding	Other pigs	Total pigs
1893	309,000	1,805,000	2,114,000
1894	351,000	2,039,000	2,390,000
1895	415,000	2,469,000	2,884,000
1896	394,000	2,485,000	2,879,000
1897	334,000	2,008,000	2,342,000
1898	362,000	2,089,000	2,451,000

ORIGIN AND FORMATION OF ORGANIC MATTER IN PLANTS.[1]

BY the ordinary method of sand culture, in which the plant is grown in sand free from organic matter, it may be demonstrated that the plant accumulates considerable quantities of carbon and

[1] From a paper by Professor P. P. Dehérain, in *Experiment Station Record*, vol. ix., No. 10. (U. S. Department of Agriculture, Washington.)

nitrogen during its growth. This carbon and nitrogen with the elements of water form the organic constituents of the plants, which with a small quantity of mineral ingredients make up the roots, stem, and leaves, and give the seed its valuable nutritive qualities. Since the soil did not contain either carbon or nitrogen, the plant must have drawn these two elements from the air. It is the purpose of this article to explain the nature of this fixation of the carbon and nitrogen of the air.

Origin of the Carbon of Plants.

The classic experiments of Priestley, in 1771, established the fact that plants exhale oxygen. Later researches made by Ingenhous and by Tennebier explained the decomposition of the carbon dioxide of the air and the evolution of oxygen by the leaves under the influence of light.

Penetration of the Carbon Dioxide into the Leaves.

The earth's atmosphere contains only 3 parts of carbon dioxide in 10,000 of air. It is evident, therefore, that in order that plants may obtain the carbon which they require from a medium so poorly supplied with it, rapidity of absorption by the tissues must compensate for the scarcity of the element in the air.

In the first place the absorption of carbon dioxide is favoured by the form of the leaves, which is such that they offer, as compared with their weight, an enormous absorbing surface. In a tree the leaves are at the extremities of infinitely ramified, flexible branches, which are agitated by the slightest breeze, thus facilitating contact of the leaves with the constantly renewed layers of air about them. That the absorption of carbon dioxide is very rapid may be shown by placing a leaf from which the air has been exhausted by means of an air-pump in an atmosphere of carbon dioxide in an apparatus[1] which measures the change of the volume. It will be observed that absorption begins instantly, but that it is largely dependent upon the quantity of the water present in the leaf. Thus, the coefficient of absorption of the carbon dioxide in old leaves of Japanese Euonymus, containing 66·3 per cent. of water, was found to be 0·70 at 15°, while in young leaves of the same tree containing 75·4 per cent. of water the coefficient was 0·83. A comparison, at different temperatures, of the coefficient of absorption of carbon dioxide in the leaves with that in pure water shows the absorption in the leaves to be somewhat greater than in pure water. This indicates that the carbon dioxide is not simply dissolved in the water in leaves, but that it combines with the water to form a hydrate. It will be shown later that this fact is of great importance.

[1] Dehérain and Maquenne, *Ann. Agron.*, vol. xii., 1886, p. 525.

Decomposition of Carbon Dioxide in Leaves.

The carbon dioxide which is absorbed by the leaves is decomposed, and the products of this decomposition are utilised in the formation of the simplest primary organic compounds, from which the more complex constituents of plants are derived. To accomplish this the principal condition is that the leaf be perfectly healthy. If it does not contain its normal proportion of water, *i.e.* if the roots do not draw from the soil as much water as is given off through the leaves, the decomposition of carbon dioxide is checked. Assimilation has ceased when, as at the end of a summer day, the leaves of the tobacco plant, for instance, are hanging down the stem, or those of the beet lie flat on the soil. In fact it has been found that the decomposition of carbon dioxide begins to decline even before the leaves have lost their turgescence.

Light is absolutely essential to the assimilation of carbon by the leaves of plants. The principal source of this energy is, of course, the sun, but attempts have been made to utilise artificial light, especially electric light, for forcing plants. Siemens in England, Bailey in America, and the author in France have made experiments of this character. Since there is no doubt that, with the increasing use of water power for the production of electricity, a large supply of electric light can be economically obtained, it is highly interesting to learn what its action is on plants. All observers have found that rays from an arc lamp without a globe exert an injurious influence, blackening the epidermis of the leaves. During the author's experiments in 1881 the epidermis exposed to the direct rays became black, while the parts protected by the upper leaves preserved their beautiful green colour. The line of demarcation was as sharp as in a photographic plate. The injurious influence ceased as soon as the lamp was surrounded by a white glass globe through which the ultra-violet rays passed with difficulty. To understand the influence which the heat rays situated at the other extremity of the spectrum exert on vegetation, we must recall to mind that in respiration leaves, like all other plant organs, absorb oxygen and exhale carbon dioxide, a process which is precisely the opposite of that which occurs in assimilation.

It must also be remembered that the activity of respiration increases with elevation of temperature, while rise in temperature has only a very slight effect on assimilation. Maquenne and the author[1] some years ago made a careful study of the action of both light and heat rays on leaves. In this research two sources of light were used, the Drummond light, which is obtained by rendering a piece of quicklime incandescent by means of the oxhydrogen blowpipe, and the Bourbouze lamp, which is composed of a cylinder of platinum wire gauze, which becomes incandescent when heated with illuminating gas, the combustion of which is promoted by a strong current of air. The leaves were introduced into tubes containing an atmo-

[1] *Ann. Agron.*, vol. v., 1879, p. 401.

sphere of known composition, and were placed very near the lights, but were protected by screens containing transparent liquids of varying diathermanous properties. In some cases water was used, which allowed the light rays to pass but retained the heat rays. In other cases the screens were filled with benzene or with chloroform, which are also transparent but much more diathermanous than water. Exposing the leaves to the action of the Drummond light, which is poor in heat rays, and surrounding them with a screen filled with water, promoted reduction, the proportion of carbon dioxide in the tube diminishing, while the oxygen increased. When the screens were filled with chloroform, however, and the Bourbouze lamp was used, which is rich in heat rays, the opposite effect was obtained, *i.e.* the carbon dioxide increased and the oxygen diminished. In this case the phenomena of respiration took the place of those of assimilation.

Passing from the study of the chemical and heat rays to that of the light rays in the central part of the spectrum, we find that the latter produce very different effects from the former. Draper demonstrated long ago that the orange rays are the most active in decomposing carbonic acid in the leaves. This conclusion was fully confirmed by the researches of Sachs, Cailletet, and the author, made nearly 30 years ago. The reasons for this special action of the rays of this part of the spectrum were not investigated until the Russian physiologist, Timiriazeff, took up the subject. He found that the rays which are most active in decomposing carbon dioxide are the orange and yellow, which are absorbed by chlorophyll when the latter is examined with the spectroscope. The same fact has been beautifully demonstrated by Engelmann. He received a ray of light upon a prism so placed under the objective of a microscope that on looking through the instrument the different rays of the spectrum could be seen. He then put a drop of water on a slide and added a filament of green alga and some putrefactive bacteria, which were aerobic. It was observed that the bacteria congregated in great numbers on that part of the alga lighted by the yellow and orange rays. In the green region only a few were observed, and these finally collected in the blue portion. In other words, the bacteria collected in the different rays in numbers approximately proportionate to their activity in assisting the decomposition of the carbon dioxide by chlorophyll.

Evidently the rays which pass freely through the chlorophyll exert no action. So it happens, as shown above, that the extreme red or the green rays are without effect on the decomposition of carbon dioxide. On the other hand, the orange and blue rays are retained and absorbed by the chlorophyll, and thus made available for the work of decomposing carbon dioxide. The fact that orange rays are much more effective than the blue is easily explained. The decomposition of the carbon dioxide, with the evolution of oxygen, requires an expenditure of energy equal to that involved in the burning of carbon in oxygen. In order, therefore that the rays may be effective for reducing carbon dioxide, they must be not only

readily absorbed but sufficiently warm. The orange rays, which are situated at the side of the spectrum where the heat rays are concentrated, are far more energetic than the blue because, in addition to being readily absorbed, they are warmer than the latter.

The decomposition of carbon dioxide can only be brought about by the aid of outside energy. This energy is supplied by the sun's rays. Since decomposition of carbon dioxide in the chlorophyll cells is the source of the organic constituents of plants, and since these substances are essential to the life of animals, we see that all living beings on the earth's surface owe their activity primarily to the sun.

Production of Carbon Compounds by Decomposition of Carbon Dioxide.

It does not suffice to know that the leaves, saturated with water, absorb the carbon dioxide of the air, and under the influence of the sun's rays evolve oxygen. It is necessary to define this process and to explain how organic matter is derived from the product of this decomposition.

Maquenne and the author, in the article already referred to, report the result of studies on the quantities of carbon dioxide absorbed by leaves, taking into account also the quantities which would be absorbed by a volume of water equal to that contained in the leaves under experiment. The results, as already stated, indicated that the absorption is not simple solution of carbonic anhydride in the water of the leaves, but a chemical combination of the carbon dioxide with water to form the acid CH_2O_3. This carbon dioxide decomposes in the leaves, giving off a volume of oxygen (O_2) equal to that of the carbonic anhydride absorbed as observed by Boussingault, and leaving a residue of formic aldehyde (CH_2O). The fact that formic aldehyde has never been found in plants might be taken as casting doubt upon the correctness of the above hypothesis, but the hypothesis is strengthened by the fact that the molecules of this aldehyde combine easily with each other; and although we do not find formic aldehyde itself we may safely assume that some at least of the bodies present are the result of combinations of molecules of formic aldehyde. As a matter of fact, bodies which might be thus formed are extremely abundant in the vegetable kingdom, as will be seen hereafter. It is known also that the aldehydes combine readily with oxygen and hydrogen, and it is of great interest to ascertain whether there are not present in plants some products thus derived from formic aldehyde. As a matter of fact such substances have been found. By oxidation formic aldehyde yields formic acid, which gives to nettles their irritating properties. The addition of hydrogen to formic aldehyde in proper proportions yields methyl alcohol, which Maquenne found in all the plants which he studied.

While the presence in plants of these two compounds so closely allied to formic aldehyde supports the hypothesis of the formation of this aldehyde in the chlorophyll cells at the moment of the decomposition of the carbon dioxide by the sun's rays, there are

other proofs of a more convincing nature. The reducing sugars are widely distributed in plants. Loew, and later Fischer, starting with formic aldehyde, have prepared these sugars artificially. They succeeded in linking together six formic aldehyde molecules, and thus formed a reducing sugar resembling those found in plants. This beautiful synthesis convinced the physiologists that the primary organic compound from which all the others are derived is formic aldehyde produced by the decomposition of the hydrated carbon dioxide. Many other compounds common in plants are formed by the combinations of molecules of formic aldehyde, such as glycerin, which exists in all oils and which contains three molecules of formic aldehyde combined with hydrogen ; the gums, which readily yield a sugar containing five molecules of formic aldehyde ; and persite, found in the fruit of the alligator pear, which contains seven molecules of the aldehyde.

Starch is easily transformed into glucose by simply heating the starch with weak acid solution. This in fact is the method employed in the commercial preparation of glucose. Starch is also transformed into glucose during germination by the action of a ferment present in the seed. This change is so easy and so frequent that there is no doubt that the transformation could be reversed ; that is, the glucose could be changed into starch. Up to the present time, however, this has not been done by purely chemical means, but when leaves are placed in a solution of glucose starch soon appears in them. The starch is formed from the glucose through the combination of several molecules of the latter, water being eliminated.

Starch is very abundant in leaves which have been exposed to sunlight. Its presence is more easily detected than that of glucose. The latter is but a transition stage, while the starch is reserve material which remains in the tissues much longer than glucose.

The starch which is so abundant at the end of the day disappears during the night. The leaf is thus seen to be both a laboratory and a storehouse which is continually emptying and filling itself. The starch disappears from the leaves in the form of glucose. Adult plants utilise this transfer form of starch in the formation of cellulose, just as young plantlets utilise the glucose formed from starch in the cotyledons of the seed during germination.

The different steps have now been traced in the formation of the organic matter of plants from the simple carbon dioxide absorbed to the complex carbohydrates of the plant tissues. It only remains to briefly discuss the derivation of some particular forms of these carbohydrates. Among the most important of these is cellulose, which forms the envelope of the cells and which is easily changed into reducing sugars under the action of acids. It appears during the germination of seeds simultaneously with the disappearance of starch. There is little doubt that it is derived from glucose, and consequently from formic aldehyde. It seems clear, therefore, that all the carbohydrates, the gums, sugars, starch, inulin, and cellulose originate in the activity of the chlorophyll cells. The same is probably true of the tannin and resin groups. There are, however,

certain plants which contain a group of sugars known as the inosites, which are true carbohydrates, but whose molecular construction is different from that of the other glucoses, since their derivatives belong to the aromatic series and not to the fatty acid series, to which the other groups belong.

There is one other important point which needs some explanation. If we study the phenomena of assimilation in a leaf which has been exposed to sunlight, we shall find that the volume of oxygen evolved equals that of the carbonic acid decomposed. The plant utilises the carbon, but the proportion of oxygen which it contains remains unchanged. This is not true, however, when we determine the changes in composition which the air in which a plant is living undergoes. Schloesing found that under such conditions the volume of oxygen evolved was larger than the volume of carbon dioxide absorbed. This indicates that the evolution of oxygen is not due simply to decomposition of carbon dioxide. Doubtless the greater part of this excess of oxygen is due to reduction of nitrates which the plants take up from the soil, but, as is shown below, a study of plant respiration reveals another source of oxygen.

Plant Respiration—the Formation of Substances Rich or Poor in Oxygen—Fatty Substances, Resins, and Vegetable Acids.

By the term respiration we understand the phenomena of the absorption of oxygen and the evolution of carbon dioxide. Respiration occurs in all plant organs, and is a function of such importance that when interfered with by the exclusion of oxygen the death of the plant results. If the roots, buds, moistened seeds, and branches of a plant be placed in a flask and a current of air free from carbon dioxide be passed over them and then led through a solution of barium hydrate, the latter will become milky, due to the formation of barium carbonate, thus showing that the vegetable matter has evolved carbon dioxide. The leaves throw off carbon dioxide except when they are exposed to the light and respiration is masked by assimilation. During the night or in dense shade they throw off carbon dioxide. When the relation between the oxygen absorbed and the carbon dioxide evolved is carefully determined, it is found that this relation is considerably modified by the temperature to which the leaves are exposed. In a low temperature the oxygen absorbed is usually greater than the carbon dioxide evolved, while in a high temperature the reverse is true, that is, there is more carbon dioxide evolved than oxygen absorbed. Since one volume of carbon dioxide contains exactly one volume of oxygen, it is evident that when the volume of carbon dioxide evolved is greater than the oxygen absorbed the plant is losing oxygen. This explains how the glucoses which are found in the pods of colza are transformed into the fatty substances of the seed, and how inosite and its derivatives formed by chlorophyll action in caoutchouc trees give a resin which is devoid of oxygen. The nature of this transformation has not yet been ex-

plained, but the above observations indicate that these substances, like starch, cellulose, and sugar, are derived from formic aldehyde, which, as already explained, is assumed to be the primary substance from which all plant substances are built up.

The formation of acids in plant tissues is explained more easily than that of fatty substances and resins. When starch or sugars are subjected to the action of dilute nitric acid, oxalic acid is produced. Similar treatment of other saccharine bodies results in the production of tartaric acid. Plant acids are due to a partial oxidation of neutral substances. When the carbohydrates oxidise at a low temperature or the penetration of oxygen into the tissues of the plant is interfered with by the structure of the organs, combustion of the neutral substances is not complete, *i.e.* they are not reduced to carbon dioxide and water. In this case the oxygen combines with the substances to produce the acids. For example, considerable amounts of oxalic acids and oxalates are found in the juice of the cactus, especially the prickly pear, which is but slightly permeable to air. When, therefore, the volume of oxygen absorbed is greater than the volume of carbon dioxide evolved it may be assumed that oxygen has been fixed by organic compounds in the plant to produce acids. These acids, then, are derived from neutral substances by oxidation, and, consequently, trace their ultimate origin to the decomposition of the carbon dioxide in the chlorophyll cells.

Origin of the Nitrogen in Plants.

Origin of the Nitrogen in Leguminosæ.

In the experiment to which attention was called at the beginning of this article it would have been impossible to grow peas without adding a few cubic centimetres of an infusion of fertile soil to the sand. If this precaution were not observed with the peas, or if the seed of some non-leguminous plant were used, the experiment would be a failure. The seed would produce a sickly plant which would soon die of starvation due to the absence of one of the elements—nitrogen—necessary to its development. Although the leaves of plants grow in an atmosphere four-fifths of which is nitrogen, they are entirely incapable of directly utilising this element.

The process by which the free nitrogen of the atmosphere is utilised by plants has only been explained in comparatively recent years. Hellriegel and Wilfarth in 1886 reported experiments which demonstrated the ability of Leguminosæ to attain normal development in soil absolutely deprived of organic matter, the only precaution necessary being the addition of a small amount of an infusion of fertile soil. A few weeks after the addition of the infusion the roots of the leguminous plants were covered with tubercles, which microscopic examination showed to be filled with micro-organisms. Bréal has shown that inoculations may readily be made with these organisms by pricking a tubercle with a needle and then inserting it into a growing root.

The tubercle bacteria have been cultivated and their products have recently been brought into commerce under the name of "Nitragin," which is used for supplying these organisms to soils which are deficient in them. The growth of leguminous plants in sterile sand depends upon the presence on their roots of tubercles filled with these organisms. Through their agency the plant is supplied with nitrogen for the production of nitrogenous matter, so that if the mineral elements are present in sufficient quantity the plant makes normal growth. The plant profits by the nitrogen furnished by the bacteria while the latter utilise the carbonaceous matter supplied by the plant, thus establishing a symbiosis. Although the process of fixation of nitrogen by the organisms and its utilisation by the plant has not yet been clearly explained, we can understand how that, notwithstanding the great quantities of nitrogen carried away from the soil with every cutting of lucerne or clover, the amount of nitrogen in the soil increases rather than decreases.

Origin of the Nitrogen of Non-leguminous Plants.

It has been shown by numerous analyses that soils abandoned for centuries to natural vegetation in which grasses predominate are quite rich in nitrogen. There are mountain meadows in France which during the open season are grazed by milch cows, and although this involves the removal of a considerable amount of nitrogen, and no fertilisers are used, these soils constantly increase in nitrogen content. While soils which are continuously cultivated frequently contain not more than $1\frac{1}{2}$ to 2 parts per thousand of combined nitrogen, permanent meadows contain 5, 7, 9, and even 10 parts per thousand. The prairies of Western America are also well stocked with nitrogen. It is interesting to trace the origin of this nitrogen.

Although the investigations of Ville and Atwater and those at Rothamsted and Grignon had proved that free nitrogen intervenes in the phenomena of vegetation, the process of fixation of nitrogen in the soil was not understood until explained by Berthelot, who showed that nitrogen is fixed in the soil by bacteria. Winogradsky cultivated certain of these bacteria in sugar solution, and found that they decomposed the solution, forming butyric and acetic acids and evolving carbon dioxide and hydrogen. They are therefore very similar to, if not identical with, the organisms studied by Maquenne and the author in 1882[1] and which decomposed sugar as explained above. The latter investigators, however, had no idea at that time that the ferments were able to fix the nitrogen of the air, and the investigation is mentioned simply to call attention to the fact that these ferments are very widely diffused, since they were found in all the soils studied. These organisms are all anaerobic, and it would seem surprising that they should grow in a medium so thoroughly aerated as arable soil; but this has been explained by Winogradsky

[1] *Ann. Agron.*, vol. ix., 1883, p. 5; vol. x., 1884, p. 5.

as follows: The organisms which fix nitrogen are capable of action only when associated with certain common species of organisms which are capable of oxidising organic matter and which thus surround the anaerobic forms with an atmosphere charged with carbon dioxide and deprived of oxygen. Winogradsky further suggests that the hydrogen set free in the decomposition of the carbohydrates furnishes ammonia, which is assimilated by the micro-organisms and used in the formation of tissue. It is not, therefore, simply the nitrogen which has recently been drawn from the air which is utilised by plants. They assimilate also the nitrogen derived from vegetable and animal remains.

The work of Pasteur has shown that the action of micro-organisms is necessary to the transformation of the complex organic substances of the tissues of living plants into the simple forms which may be assimilated by plants. Without these organisms life would be impossible, as Pasteur himself has said, because the work of death would be incomplete. By their intervention the complex substances are burned, the carbon passing into the form of carbon dioxide, the hydrogen into water, and the nitrogen into ammonia; and in these different forms the matter is again carried into circulation.

It often happens that vegetable matter remains for a long time in the form of humus; but even in this form it is utilised by plants. The humus is constantly subjected to the oxidising action of the lower organisms, and undergoes gradual decomposition. The ammonia produced by the decomposition of the humus is assimilated by plants as well as the readily available product of oxidation, nitric acid.

Schloesing and Müntz 20 years ago showed that nitrates are formed in the soil by the action of organisms. More recently Winogradsky has demonstrated that the action of two different organisms is necessary for the transformation of ammonia into nitrates—one converts ammonia into nitrites and the other completes the oxidation, producing nitrates. We thus see that micro-organisms seize upon the nitrogen of the air and convert it into organic compounds; they convert vegetable matter into humus, and then break down this humus, producing ammonia and finally nitrates. At every step they perform a useful work, and are valuable auxiliaries of agriculture.

There are, however, other organisms which interfere with the work of the beneficial kinds. Bréal observed several years ago that there is an aerobic organism which decomposes nitrates and sets elementary nitrogen free. This organism is abundant in vegetable débris, especially in straw. It is also encountered in the excrement of domestic animals. The extent to which the losses of nitrogen in arable soils is due to the action of this denitrifying organism and the conditions most favourable to its action are questions which require further investigation.[1]

---

[1] See *Denitrification and Farmyard Manure*, by Professor R. Warington, M.A., F.R.S. Journal R.A.S.E., 3rd series, vol. viii., 1897, p. 577.—Ed.

The Different Forms in which Nitrogen is Utilised by Plants.

If we follow the example of Boussingault and plant a sunflower seed in a sterile soil to which the necessary mineral matter and increasing amounts of nitrates are added, or if we repeat the experiment of Hellriegel and plant barley in well-washed sand to which sufficient mineral matter and increasing amounts of calcium nitrate are added, we shall find that the crop produced increases with the amount of nitrate added. In Hellriegel's experiments less than 1 gm. of dry matter was produced when nitrates were not added, the production of dry matter increasing to 25 gm. when sufficient nitrates were supplied.

These experiments, however, simply demonstrated in an exact manner facts which were already well known in practice. The consumption of nitrate of soda would never have reached its present enormous proportions if farmers had not learned to appreciate the efficacy of nitrates as a fertiliser. At the present time they enter into all fertiliser formulas. The application of this fertiliser is necessary, because we are not yet able to so control nitrification in the soil that it can be made to furnish sufficient nitrates for the demands of the crop at exactly the time in the spring when they are most needed. Nitrates are produced only in warm and moist soils, and they are found in the drainage water in larger proportion in autumn than in any other season. Fortunately the roots of living plants have great capacity for retaining the nitrates, and thus reduce the loss in drainage.

If wheat roots are drawn from the soil during the winter, dried, and soaked in sulphate of diphenylamin, they will take on a deep blue colouration. The amount of nitrates contained in wheat roots is surprisingly large. The author has found as much as 1 per cent. in dried roots, but the proportion decreases as growth advances. They pass from the roots to the stems and then to the leaves, where they are used in the formation of albuminoid substances. It might be a matter of surprise that substances which are so easily soluble in water as the nitrates can nevertheless be taken up and retained by roots even when surrounded by moist soil. Demoussy has shown that nitrates can not be removed from the roots by washing in cold water, but are extracted when the roots are treated with warm water or when they are subjected for some time to an atmosphere of chloroform and then washed with cold water. It appears, therefore, that the nitrates penetrate by osmosis into the interior of the cells and form unstable combinations with the protoplasm, resuming their normal state only when the protoplasm is modified by elevation of temperature or the action of chloroform.

Experience has shown that whether nitrates are formed in the soil by the action of micro-organisms, or introduced in the form of fertilisers, they exert a decided influence upon the crop. Nitrates are not formed in soils like those of meadows or forests, which are highly charged with decaying organic matter, since these soils are acid and therefore do not furnish a suitable medium for the nitric ferment. Liming renders such soils more favourable to the activity of the nitric organisms.

In meadow and forest soils nitrogen appears to be taken up by plants in the form of ammonia. Bréal[1] has shown that nitrogen is also taken up by plants in the form of humates of lime or potash.

Hellriegel has shown in experiments with barley fertilised with variable amounts of nitrates that the amount of water transpired by the plant per gram of dry matter increases as the amount of nitrate applied decreases. Barley, which received the most favourable amount of nitrates, evaporated 260 gm. of water per gram of dry matter produced. The plants which received no nitrates and which made a sickly growth evaporated from 700 to 800 gm. of water per gram of dry matter. Normal, vigorous plants obviously evaporate more water than sickly ones, but if we calculate the ratio of the quantity of water transpired to the weight of dry matter produced we find that the proportion is greater in the sickly than in the vigorous plants. This fact may be useful in determining the efficacy of a fertiliser.

By pursuing this method of investigation the author found that the Gramineæ and Leguminosæ do not take up and utilise plant food in the same manner. The Gramineæ are especially benefited by chemical fertilisers, particularly nitrates, while they do not utilise humus substances to very great advantage. On the other hand, Leguminosæ are more benefited by the humates than by nitrates or ammonia salts.

Rye grass and clover were planted in large pots, each of which contained 50 kg. of soil exhausted by continuous cropping. Equal amounts of phosphoric acid, potash, and nitrogen were applied. In one case the nitrogen was applied in the form of nitrates, in the other in the form of humate. A black extract from manure which contained a mixture of humate of potash and humate of ammonia was also used. At the end of the experiment it was found that the rye grass which had received no manure had transpired 682 gm. of water per gram of dry matter, that which had received humates 435 and 469 gm., and that which had received only chemical fertiliser 233 gm. The results were quite different with clover. In this case the transpiration was: without manure 454 gm., with chemical fertilisers 398 gm., and with humates 272 and 265 gm. These results confirm the conclusions of Bréal, Snyder, and Lawes and Gilbert. The latter have shown at Rothamsted that it was impossible to grow clover continuously on the same land unless the soil was abundantly supplied with organic manures.

To summarise, then, nitrogen is taken up by plants in the form of nitrates, ammonium salts, and alkaline humates. The Leguminosæ can utilise free nitrogen only when it has been brought into combination by the action of the organisms of the root tubercles. It has frequently been claimed that other plants besides the Leguminosæ are capable of absorbing free nitrogen, but it has been shown that this absorption does not take place without the intervention of the organisms which fix nitrogen.

---

[1] *Ann. Agron.*, vol. xx., 1894, p. 353.

RECENT AGRICULTURAL INVENTIONS.

The subjects of Applications for Patents from March 11 *to June* 10, 1899.

N.B.—Where the Invention is a communication from abroad, the name of the Inventor is shown in italics, between parentheses, after the name of the applicant.

Agricultural Machinery and Implements, &c.

No. of Application. Year 1899.	Name of Applicant.	Title of Invention.
5573	Bamford, S. B., & another	Chaff-cutters.
5876	Lake, H. H. (*Deering Harvester Co., U.S.A.*)	Harvesters.
6237	Wilkinson, A.	Preserving hops.
6541	Limond	Planting potatoes, cabbages, &c.
6561	Paige, W. R.	Machine for gathering and binding corn.
6570	Dambacher, A.	Digging and gathering potatoes.
6607	James, R. W. (*Carroll, J., U.S.A.*)	Cultivating machines.
6786	Loveland, W. H.	Tool for cutting turf, &c.
7196	Hamblin, C.	Hay collectors.
7323	Wright, J.	Mowing machines.
7376	Denton, H. S.	Harrows.
7419	Hogarth, J. & R.	Attachment for threshing machines.
7499	Sleep, W. H. & H.	Shares of ploughs, &c.
7596	Hepple, J.	Attaching scythe blades to their poles.
7802	McLarty, F. M.	Cutting and collecting grass, corn, &c.
7811	Zahl, Y.	Potato planting machines.
7880	Birtwisle, W	Mowing and reaping machines.
8002	Courtman, T.	Machine hoe.
8531	Buchanan, D.	Potato digger.
8702	Choat, W.	Safety-feeding appliances for chaff-cutters.
9029	Ehmke, P.	Manure-distributor.
9305	Bingham, G. C.	Mowing and reaping machine.
9321	Dambacker, A.	Machine for pulling up potato plants.
9364	Goldstraw, J.	Chopping hay and straw.
9494	Bamford, S. B.	Chaff-cutters.
9495	Martin, T. E.	Seed drills, &c.
10138	Golwer, I.	Corn feeders for threshing machines.
10363	Hutcheson, W. A.	Housing and storing cut crops.
10539	Sleep, W. H.	Turn wrest-ploughs.
10540	,, ,,	Horse-rakes.
10569	Hodgson, G. F.	Turnip hoes.
10606	Teasdale, R. & J.	Haymaking machinery.
10626	Griffiths, F.	Weed extractor.
11021	Oakley, F.	Spraying hop vines, &c.
11362	Shuttleworth, A. & F.	Threshing machines.
11376	Pratt, B. R.	Potato digging and screening machines.
11589	Sargeant, T. C.	Distributor.
11694	Atterbury, J. E.	Distributing manures.
11784	Rochard, B., & anr.	Hand-power reaping machine.
11998	Bingham, G. S.	Chaff-cutters.
12074	Lake, H. H. (*Steward, J. F., U.S.A.*)	Harvesting machines.

Stable Utensils and Fittings—Horse-shoes, &c.

No. of Application. Year 1899.	Name of Applicant.	Title of Invention.
5809	HARVEY, A. E.	Collars and saddles.
5866	GOODWIN, J. H.	Materials for harness.
5948	MAIGRET, A.	Girths for saddles.
6371	YEADON, E., & anr.	Horse-shoes.
6406	TANNER, A. S.	Reins.
6470	BURNELL, H. B.	Horse-shoes.
6483	PLUMMER, J.	Horse collars.
6619	HOLDSWORTH, G. E.	" "
6899	BALME, A.	Nailless horse-shoe.
6976	LLOYD, E.	Metal shaft-tug.
7053	ALEXANDER, A. E. (*The Humane Bridle Co., U.S.A.*)	Horse controllers.
7181	BARTON, W. W. & A. T.	Clipping horses.
7238	ALEXANDER, A. E. (*Haslehurst, U.S.A.*)	Padded horse-shoes.
7368	READ, A. W.	Dressing and combing manes and tails.
7384	MORGAN, W. H.	Frost shoe for horses.
7408	HARWOOD, S. J.	Numnahs.
7558	ROBSON, W.	Controlling yoked horses when unattended.
7593	BASSETT, H.	Hopple.
7631	MUDD, W. R., & anr.	Harness tugs.
7853	GRIFFITH, H, & anr.	Improved horse-shoe and nails therefor.
8087	PINDER, W., & others	Traces, &c.
8502	BLYTH, W. E.	Panels for riding saddles.
8598	TYSOE, H.	Harness.
8850	CAZALET, E. J.	Running reins and martingales.
9107	BRADLEY, G.	Horse-shoes.
9120	HIRSCH, J., & anr.	Horse-shoe.
9234	EDWARDS, E.	Closing cracks in horses' hoofs.
9237	HOWE, W. R.	Fastening elastic treads in horse-shoes.
9371	BOYES, W.	Trace hooks for harness.
9576	ABRESCH, E.	Blinkers.
9623	ALLEN, J.	Side spring hame chain.
9759	LEMON, J. G., & anr.	Horse-shoes.
9973	SHAW, W. E.	Horse-shoes.
10186	EARLY, C., & others	Horse rugs.
10273	COOPER, S. A., & anr.	Hames.
10479	DEADMAN, J.	Automatic horse ties.
10759	PIERCE, J. T.	Horse detachers.
11326	ERICHSEN, H. P.	Hoof pads.
11628	THOMPSON, R.	Nosebag.
11741	BRAIN, G.	Curry combs.
11745	PUMPHREY, E. M.	Feed-boxes.
12003	WILKINSON, J.	Harness saddles.

Dairy Utensils, &c.

Year 1899.		
5778	JOHNSON, J. J. (*Cameron, U.S.A.*)	Churns.
6467	MILLIGAN, S.	Means for "turning" cheeses.
7922	LITTLETON, F. J.	Milk cans.
8157	LAWRENCE, G.	Machinery for churning, &c.
10061	TALBOT, C. E.	Churns.

No. of Application. Year 1899.	Name of Applicant.	Title of Invention.
10325	TICE, V. G.	Machine for cutting butter and cheese.
10343	HOLLAND, T. (*Cheney, T. J., U.S.A.*)	Churns.
10214	BORCHGREVINK, H. K., & another	Milk pails.
10520	FLYNN, J., jun.	Butter-working machines.
10857	HENDRIC, J. (*Mackintosh, J.*)	Churns.
10889	SAUNDERS, A.	Cheese-cutting wires.
10942	BRADFORD, W. L.	Churning machines.
11706	VAN DEN BERGH, S.	Butter-worker.

Miscellaneous.

Year 1899.		
7181	BARTON, W. W. & A. T.	Machinery for shearing sheep.
7206	MEADOWS, W. P.	Bee-hives.
7518	STAINER, T.	Feeding troughs for poultry.
9400	Adam's Manure and Chem. Co., Ltd., and Macadam, H. E.	Compound for dipping sheep.
9818	HEMMING, T. A.	Combined folding hurdle, hay-rack, &c.

Poultry and Game, &c., Appliances.

Year 1899.		
6219	BINGHAM, J. A.	Apparatus for proving and classing eggs.
6993	HOOPER, J. A.	Foster-mother and incubator.
7301	MCNAMEE, F.	Egg-protector and preserver.
9710	BUSSEY, J., & anr.	Incubators, &c.
10155	FIÈNT, H. G.	Pigeon commode or stand.
10178	ROSE, H. J. F.	Mounting portable poultry houses on wheels.
10740	WICKENS, J. H.	Poultry cramming machine.
11575	HAZLEHURST, G. S.	Foster mothers.

Numbers of Specifications relating to the above subjects published since March 11, 1899.[1]

(Price 8*d.* each copy.)

Specifications of 1898.

2665, 6510, 8938, 9186, 9431, 9592, 9999, 11177, 11262, 11311, 11546, 11584, 11587, 11707, 12435, 12546, 12813, 13039, 13552, 13773, 14068, 14426, 14525, 14869, 14893, 15412, 15564, 16185, 16520, 17560, 19954, 26108, 27054.

Specifications of 1899.

87, 122, 2363, 2619, 2651, 2661, 3195, 3261, 3288, 3561, 3829, 4277, 4378, 4437, 4459, 4875, 4921, 5778, 5876, 5948, 6128, 7053, 7058, 7196, 7238, 9120.

[1] Copies may be obtained at the Patent Office (Sale and Store Branch), Quality Court, Chancery Lane, London, E.C.

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY

OF ENGLAND.

A SKETCH OF THE AGRICULTURE OF KENT.

CONTENTS.

INTRODUCTION.

As the annual Country Meeting of the Royal Agricultural Society was held this summer at Maidstone, the county town of Kent, it seems suitable that an account of the agriculture of the county should be given in the Journal of the Society while the recollections of the visit are still fresh in the minds of its members. It will also be useful and interesting to have a description of the leading features of the agriculture of Kent at the present time, and a record of the changes that have taken place since the prize essay on "The Farming of Kent," written by Mr. Buckland, appeared in 1845, in the sixth volume of the first series of the Journal, which is the only description of the agriculture of this county that has been given in its pages, though accounts of the Fruit Farming and Hop Farming of Kent were published in the sixth and thirteenth volumes (1870 and 1877) of the second series.[1]

[1] *On the Cultivation of Hops*, by Charles Whitehead, F.L.S., F.G.S.; *Fruit-growing in Kent*, by Charles Whitehead, F.L.S., F.G.S.

Besides the changes that have taken place since Mr. Buckland wrote in 1845, due to the alterations and improvements in agriculture more or less common to the whole country, there have been great changes consequent upon the low prices of farm produce, especially of wheat, in Kent as well as in all other counties. When Mr. Buckland's essay was published more than half a century ago, Kent was a large wheat-growing district, and was celebrated for fine wheats which had special market quotations, and were sought for by millers. Only 53,494 acres were sown with wheat in 1898, and it is seen, on an examination of the returns of the Board of Trade and the Board of Agriculture for the last thirty years, that the reduction in the acreage sown with wheat has been greater than that of the average of the other English counties. In 1868, 110,720 acres of land were sown with wheat in Kent according to the Board of Trade returns, or more than a tenth part of the land in the county.

The following table shows the areas of land sown with various crops in Kent in the years 1868 and 1898:

—	1868	1898
	acres	acres
Wheat	110,720	53,494
Barley	38,179	36,535
Oats	53,016	43,804
Beans	23,161	6,655
Peas	20,819	13,590
Mangels	8,400	10,958
Turnips and Swedes . .	32,070	20,871
Potatoes	14,188	13,276

In 1868 the total acreage of land under corn crops was 246,305 acres; while in 1898 there were only 155,004 acres sown with these crops. In 1868 there were 15,844 acres of bare fallow and only 8,029 acres in 1898, and the figures given below show that there has been a considerable increase in the quantity of grass land.

—	1868	1898
	acres	acres
Permanent pasture	295,009	406,607
Clover and other grasses under rotation .	47,452	54,023

Woodland has increased in extent from 78,000 acres in 1868 to 96,927 acres. Ash and chestnut plantations have been made by several large landowners, and larch fir has been planted to some extent for hop-poles.

During the last thirty years large additions have been made to the acreage of land planted with fruit trees and fruit bushes. There were 25,050 acres of orchards and 22,080 acres of small fruit in 1898; but it is difficult to state the actual increase since 1868, as no returns of fruit land were given until 1872, and in the last three or four years separate returns have been made of fruit land under the heads of orchards and of small fruits. It is estimated, however, that since 1868 the whole area of fruit land in Kent has more than doubled.

The extent of land used for market gardening in Kent has enormously increased since 1868. Here again there are no returns reliable for purposes of comparison, as it was found impossible to differentiate between the market-garden acreage cultivated by *bonâ fide* market gardeners and by farmers; but it is believed that at least 20,000 acres are devoted to the production of vegetables, salads, herbs, and flowers.

Owing to the low prices obtained for hops in recent years, the acreage has diminished, having been 30,941 acres in 1898, as against 38,606 acres in 1868. The largest hop acreage in Kent was in 1885, when there were 44,834 acres.

It would be naturally thought that with so large an addition to the grass land there would be found a somewhat proportionate increase in the number of cattle and sheep, but it will be seen below that the former have only increased by 13,950 head, while sheep have decreased.

—	1868	1898
Cattle	63,087	77,037
Sheep	1,025,115	937,261 [1]
Pigs	45,987	57,282
Horses	32,235	27,614

Of the increase in cattle it would be expected that dairy cattle would form a large portion, although Kent is by no means a dairy county. Accordingly, the numbers of cows and heifers in milk show a difference of 6,257 head; the figures being 26,919 in 1868, and 33,176 in 1898. The falling off in the sheep stock of the county is due without doubt to the losses sustained by the farmers since 1879, and to the want of capital to keep up the farm stock to the capabilities of the grazing area. This area has been extended mainly on account of the impossibility of making the heavier and poorer arable land in the county

[1] It should be stated that the proportion of the number of sheep in Kent per 1,000 acres in 1897 was 957, or a larger proportion than in any other English county.

pay for cultivation, and not a small part of it has "laid itself down," or has been converted into grass land by simple and inexpensive processes. Upon the stiff clay in the Weald of Kent, the poor light soils on the Chalk in parts of East Kent, and the stiff marls on the Chalk in districts in East Kent and North-west Kent, indifferent pasture has, in some degree, taken the place of plough land. Landowners who have had farms thrown on their hands in various districts have also put land down to grass as the only possible means of avoiding heavy losses upon it, even in the better soils, in some instances.

Horses have diminished in number since 1868 on account of the lessened area of plough land and the extended use of traction engines. In 198 the extent of land under crops and grass was 748,957 acres, of which 561,250 acres were held by tenants, and 187,707 by owners. Much of this land occupied by owners is farmed by them compulsorily, on account of the failures of tenants and of inability to replace them, and the amount of land thus held by the owners has increased nearly 20 per cent. in the last ten years. The small landowners have in most instances been compelled to sell their land, and the yeoman of Kent has practically disappeared, so that there is, unhappily, no longer any application in the time-honoured Kent proverb—

> A knight of Cales,
> A gentleman of Wales,
> And a laird of the North Countree,
> A yeoman [1] of Kent,
> With his yearly rent,
> Will buy 'em out all three.

There is another rhyme as to yeomen of Kent—

> All blessed with health, and as for wealth,
> By Fortune's kind embraces
> A yeoman grey shall oft outweigh
> A knight in other places.[2]

General Features.

The county of Kent is about 40 miles in width between the extreme north and south boundaries, at Gravesend and Tunbridge Wells. In length, taking a straight line between Ramsgate and Beckenham, it is about 60 miles. It has exceptional facilities for the transport of agricultural produce by two

---

[1] Yeoman is derived from *gemein*, the German for common. A yeoman is essentially a commoner. Lambarde has it that yeoman comes from *yemen*, the Saxon for common.—Ray's *Kent Proverbs*.

[2] *A Collection of Proverbs and Old Sayings which are either used in or relate to Kent*, by Samuel Pegge, A.M.

railways whose main lines and branches intersect the county, and by vessels borne on the rivers Thames, Medway, and Stour, and the sea which bounds its eastern and north-eastern coasts.

The climate of Kent is well described by Mr. Buckland as mild and salubrious, though the north-eastern portion is much exposed to the keen and chilling winds of Northern Europe, unmodified in any degree by the influence of a wide expanse of water, and somewhat out of the direct line of influence of that beneficent river in the ocean, the Gulf Stream. The myrtle thrives and puts forth its fragrant blossoms on the southern walls of houses in the valleys, with occasional protection during severe frost, and the magnolia yields its large perfumed flowers sheltered by walls in the warm nooks and corners of old-fashioned gardens. The chief drawback of the climate is the tendency to white frosts late in the spring, which frequently injure the fruit and other crops, particularly in valleys, and on the southern slopes, upon which the first sun-rays fall. The tender hop-bines also are often much injured in this way. The information in the annexed Table with regard to the temperature and rainfall has been furnished by the courtesy of Dr. Scott, the secretary of the Meteorological Office.

Mean Summer and Winter **Temperature** *and* **Rainfall** *for* **Kent,** *based on Observations made since the year* 1880.

Months		Temperature mean		Months		Rainfall mean	
		deg.	deg.			in.	in.
Summer	June	58·6	60·8	Summer	June	1·76	2·13
	July	61·8			July	2·50	
	August	61·9			August	2·14	
Winter	December	39·6	39·1	Winter	December	2·49	2·12
	January	38·3			January	2·12	
	February	39·5			February	1·76	

The prevailing winds are north-east and south-west. The former, coming from the German Ocean, occasionally cause considerable injury to the crops at certain seasons, as for example to the cherry crop when the trees are in full blossom. The long range of Chalk hills from Folkestone to Wrotham affords some protection from these blasts to the districts which they overshadow. But the harvest in the Isle of Thanet in the extreme north and north-east part of the county is more forward than in the sheltered districts, where the soil is heavier and more wet. Harvest commences generally in Thanet in the last week of July, a few days later in the lower parts of East Kent

and on the Greensand formation, and later still on the clays of the Weald and the cold marls on the hills between Rochester and Farningham.

The name Kent, or Chent, as it is termed in the Domeboc or Domesday Book, came from *Cantium*, as the county was called by the Romans. Camden [1] says:—"As I observe Britain runs out here with a large corner eastward, and find the like corners in Scotland called Cantis, and the inhabitants of another corner in that part of this island called by Ptolemy Cantel, I should suppose the name given it from its situation." Hasted [2] states that Cantium is derived from *canton* or *cant*, meaning a corner or angle of land.[3] Land appears to have been cultivated earlier in Kent than in other parts of Britain, as at the time of the first invasion of the Romans, 55 years before the birth of Christ, it was inhabited by Belgic Gauls, as Hasted calls them, who came over to pillage and remained and sowed corn, contrary to the custom of those who inhabited the inland parts of Britain. The inhabitants of Kent are described by Cæsar in *De Bello Gallico* as having plenty of cattle and being more civilised than those in other parts of the country; Shakespeare has it:

> Kent, in the commentaries Cæsar writ
> Is termed the civilest place of all this isle;
> Sweet is the country because full of riches,
> The people liberal, valiant, active, wealthy.

Kent has doubtless suffered many things from its propinquity to the Continent and the frequent invasions of Romans, Gauls, Danes, Saxons, and Normans. But it has also been of much advantage, as civilisation followed in the train of some of the invaders, and agriculture and other industries profited much. For instance, in the sixteenth century, the Walloons, flying from persecution and welcomed by the sagacious Elizabeth, established woollen manufactories and stimulated the production of wool. Iron smelting was introduced by refugee Flemings and Frenchmen, and indirectly benefited agriculture. Mr. Furley writes: "The impetus given to the trade in iron and wool induced the owners of the woods to clear them with a rapidity that became alarming." [4] Great breadths of the ancient forest of Anderida—the

---

[1] Camden's *Britannia: a History of the British Isles*, 1551.

[2] *The History of the County of Kent*, by E. Hasted, Esq., F.R.S., vol. i., p. 3, 1780.

[3] "*Cant*" is now used by farmers and labourers generally in Kent to denote a part of a field; thus a hop-garden is divided into "cants" for cultivating, a field of wheat is "canted" for cutting. Pegge, in his *Alphabet of Kenticisms*, confirms this.

[4] Furley's *History of the Weald of Kent.*

Sylva Anderida, or Andredswold, which covered the Weald Clay and Hastings Sand districts of Kent—were grubbed for smelting iron and to provide cultivable land to furnish food for the workers in the manufactories. Distinct traces of the smelting furnaces can be seen in the Weald of Kent and Sussex to this day. The cultivation of hops was introduced into Kent by the same refugee Flemings, about the middle of the sixteenth century, and has added in an incredible degree to the prosperity of its inhabitants. At the same time the cultivation of many kinds of fruit was introduced into the county, as "before that date," according to Fuller, "we fetched most of our cherries from Flanders, and apples from France." [1]

New vegetables of various descriptions were brought over from the Low Countries about this same period, together with the knowledge of their cultivation. Sandwich seems first to have received these novel cultures, as to which Fuller writes: "Since market gardening hath crept out of Holland to Sandwich in Kent, and thence into Surrey, where, though they have given 6*l.* per acre, they have made their rent, lived comfortably, and set many people at work." [2] "It was," says Hume, "not until the reign of Henry VIII. that any salads, turnips, or edible roots were produced in England." [3] Dr. Robert Child, writing in 1682, observes:—"Gardening is but of few years standing in England, and therefore not deeply rooted. About 50 years ago, about which time ingenuities first began to flourish in England, this art of gardening began to creep into England, into Sandwich, Fulham, and other places." [4] Smiles, in his *History of the Huguenots*, remarks, among other branches of industry introduced by the Flemings at Sandwich, that of gardening is worthy of notice. "The first Flemish gardens proved highly successful. The cabbages, carrots, and celery produced by the foreigners met with so ready a sale that a body of the gardeners removed from Sandwich and settled at Wandsworth, Battersea, and Bermondsey." [5] According to Harrison,[6] however, gardening, or the cultivation of vegetables, was practised in England so early as the time of Edward I., but after this vegetables "became unknown again, or supposed as food more meet for hogs and savage beasts to feed upon than mankind," and it would appear from this that there was a revival of their cultivation and use in the sixteenth century.

[1] Fuller's *Worthies of Kent*, 1680.
[2] *Ibid.*
[3] Hume, *History of England.*
[4] Dr. Robert Child.
[5] Smiles, *History of the Huguenots*, p. 57.
[6] *An Historical Description of the Island of Britain*, by William Harrison 1577.

Vegetables and salads are grown extensively at present at Sandwich and its neighbourhood.

In describing the agriculture of Kent, Boys divides it into two grand districts of West and East Kent.[1] Buckland, however, describes it in three great sections, according with its geological character, viz.: (1) the Chalk, having detached portions of the London Clay resting upon it; (2) the Greensand, provincially called the Kentish Rag; and (3) the Wealden, comprising the Weald Clay, strictly so called, and the "Iron" or Hastings Sand, together with the extensive alluvium of Romney Marsh.[2] Marshall, in his *Southern Counties of England*, describes the District of Maidstone, the Weald of Kent, the District of Canterbury and the Isle of Thanet.[3] Camden gives another quaint division of the county. "The inhabitants, according to situation from the Thames southward, distinguish Kent into three plots or portions—they call them degrees: the upper, lying upon the Thames, they look upon to be healthy, but not altogether so rich; the middle part to be both healthy and rich; the lower to be rich, but withal unhealthy, because of the wet marshy soil in most parts of it."[4]

The distinctions in the kinds of crops cultivated in Kent and in the rotations of crops are defined in a great degree by the geological conditions, which are of a most varied character, as may be seen by examining the geological map (fig. 1), and the apparent differences between good and bad farming, as presented to critics travelling through the county, are caused frequently by the vagaries of outcrops of the Wealden formation. For example, a critical expert passing in ordinary seasons from Dover by way of Sandwich, Canterbury, Faversham, Gravesend and the Crays to London, would see fine crops, and draw conclusions consequently of fine management, upon the soils of the lower London Tertiaries. If he returns to Dover by Chislehurst, Sevenoaks, Tonbridge, and Ashford, he will find comparatively poor crops, and an appearance of indifferent farming, upon the stiff soils of the Weald Clay. The careful observer, Arthur Young, gives a record of pilgrimages in the same direction as those imagined above, and marks the difference in the style of the agriculture, but he does not appear to have con-

[1] *A General View of the Agriculture of the County of Kent*, drawn up for the consideration of the Board of Agriculture by John Boys, Betshanger, farmer, 1805.

[2] *On the Farming of Kent*, by George Buckland, land-agent, Journal R.A.S.E., vol. vi., 1845.

[3] *The Rural Economy of the Southern Counties*, by Mr. Marshall, 1798.

[4] Camden's *Britannia*.

sidered that much of this was due to geological variations of the soil. He says:

> Where the excellent husbandry of Kent is mentioned it must always be understood in a very limited sense. From London to Canterbury, and from Canterbury to Sandwich, spreading a little towards Deal and Dover, is a line of very excellent management, which extends to the river Thames and to the sea, and includes the whole Isle of Thanet, but it spreads very little to the south of that road. Exceptions are certainly to be found, but speaking generally the true Kentish management is only in the district thus traced. The Weald of Kent, which comprehends so large a part of the county, is under very bad management.[1]

It is proposed in this sketch to describe the agriculture of Kent in four divisions—East Kent, Mid Kent, North Kent, and the Weald of Kent; and four sub-divisions—Romney Marsh, the Isle of Thanet, the Isle of Sheppey, and the Hundred of Hoo.

East Kent.

Much of the land in the first division, East Kent, consists merely of a more or less shallow covering of mould upon the Chalk; loamy, friable, and kindly in some districts, and in others marly and unkindly, the latter being called "strong cledge" by Boys.[2] These features characterise the soil on the south of Canterbury as far as Deal, Dover, Folkestone, and Ashford, and the slopes of the Chalk hills as far as Rochester. The rotation in these districts is the four course—wheat, turnips, barley, and grass; or a seven years' course—turnips, barley or oats, seeds, wheat, barley or oats, peas or beans. The latter rotation is adopted only on the better land. This is varied by sainfoin sown with barley or oats, or by sowing Italian rye-grass and white clover—which thrives well in this district—and letting it remain down for two or three years. Barley and oats have taken the place of wheat to a considerable extent. Hops are grown in most parishes here, but there is not much fruit land. Flocks of Kent sheep are kept on many farms. Some of the farmers here also have grazing land in Romney Marsh, which they work in connection with their arable farms with much advantage. It is usual for many farmers to put wether lambs and ewe lambs not required for breeding on corn or cake as soon as they will eat it, and fatten them out before they are a year old. Lambs are bought at the large fairs at Romney and Ashford in the early autumn for this purpose. There is some very useful pasture land on the Gault on the edge of the

[1] *Annals of Agriculture*, by Arthur Young, Esq., F.R.S., vol. ii., 1784.
[2] Boys, *General View of the Agriculture of the County of Kent.*

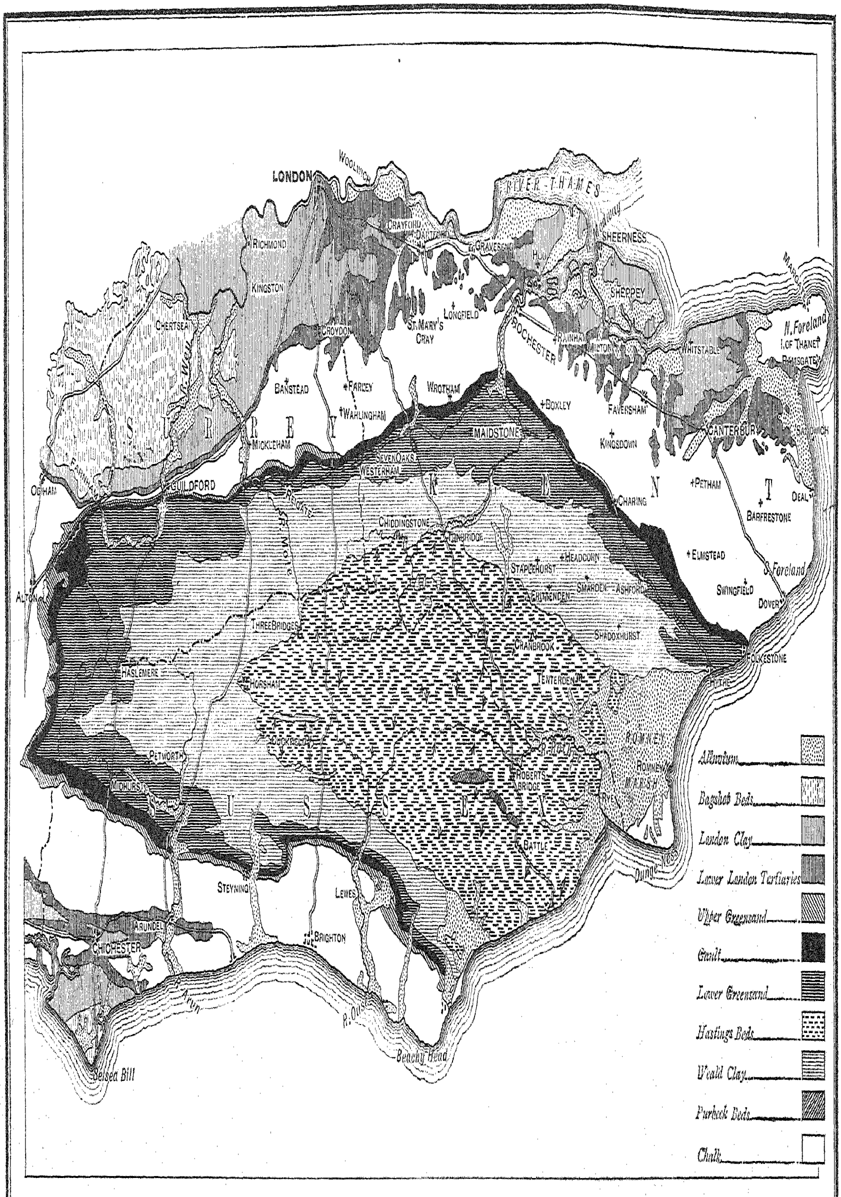


FIG. 1.—Geological map of the Weald.

[*To face* p. 436.

Vegetables and salads are grown extensively at present at Sandwich and its neighbourhood.

In describing the agriculture of Kent, Boys divides it into two grand districts of West and East Kent.[1] Buckland, however, describes it in three great sections, according with its geological character, viz.: (1) the Chalk, having detached portions of the London Clay resting upon it; (2) the Greensand, provincially called the Kentish Rag; and (3) the Wealden, comprising the Weald Clay, strictly so called, and the "Iron" or Hastings Sand, together with the extensive alluvium of Romney Marsh.[2] Marshall, in his *Southern Counties of England*, describes the District of Maidstone, the Weald of Kent, the District of Canterbury and the Isle of Thanet.[3] Camden gives another quaint division of the county. "The inhabitants, according to situation from the Thames southward, distinguish Kent into three plots or portions—they call them degrees: the upper, lying upon the Thames, they look upon to be healthy, but not altogether so rich; the middle part to be both healthy and rich; the lower to be rich, but withal unhealthy, because of the wet marshy soil in most parts of it."[4]

The distinctions in the kinds of crops cultivated in Kent and in the rotations of crops are defined in a great degree by the geological conditions, which are of a most varied character, as may be seen by examining the geological map (fig. 1), and the apparent differences between good and bad farming, as presented to critics travelling through the county, are caused frequently by the vagaries of outcrops of the Wealden formation. For example, a critical expert passing in ordinary seasons from Dover by way of Sandwich, Canterbury, Faversham, Gravesend and the Crays to London, would see fine crops, and draw conclusions consequently of fine management, upon the soils of the lower London Tertiaries. If he returns to Dover by Chislehurst, Sevenoaks, Tonbridge, and Ashford, he will find comparatively poor crops, and an appearance of indifferent farming, upon the stiff soils of the Weald Clay. The careful observer, Arthur Young, gives a record of pilgrimages in the same direction as those imagined above, and marks the difference in the style of the agriculture, but he does not appear to have con-

[1] *A General View of the Agriculture of the County of Kent,* drawn up for the consideration of the Board of Agriculture by John Boys, Betshanger, farmer, 1805.

[2] *On the Farming of Kent,* by George Buckland, land-agent, Journal R.A.S.E., vol. vi., 1845.

[3] *The Rural Economy of the Southern Counties,* by Mr. Marshall, 1798.

[4] Camden's *Britannia.*

sidered that much of this was due to geological variations of the soil. He says:

Where the excellent husbandry of Kent is mentioned it must always be understood in a very limited sense. From London to Canterbury, and from Canterbury to Sandwich, spreading a little towards Deal and Dover, is a line of very excellent management, which extends to the river Thames and to the sea, and includes the whole Isle of Thanet, but it spreads very little to the south of that road. Exceptions are certainly to be found, but speaking generally the true Kentish management is only in the district thus traced. The Weald of Kent, which comprehends so large a part of the county, is under very bad management.[1]

It is proposed in this sketch to describe the agriculture of Kent in four divisions—East Kent, Mid Kent, North Kent, and the Weald of Kent; and four sub-divisions—Romney Marsh, the Isle of Thanet, the Isle of Sheppey, and the Hundred of Hoo.

East Kent.

Much of the land in the first division, East Kent, consists merely of a more or less shallow covering of mould upon the Chalk; loamy, friable, and kindly in some districts, and in others marly and unkindly, the latter being called "strong cledge" by Boys.[2] These features characterise the soil on the south of Canterbury as far as Deal, Dover, Folkestone, and Ashford, and the slopes of the Chalk hills as far as Rochester. The rotation in these districts is the four course—wheat, turnips, barley, and grass; or a seven years' course—turnips, barley or oats, seeds, wheat, barley or oats, peas or beans. The latter rotation is adopted only on the better land. This is varied by sainfoin sown with barley or oats, or by sowing Italian rye-grass and white clover—which thrives well in this district—and letting it remain down for two or three years. Barley and oats have taken the place of wheat to a considerable extent. Hops are grown in most parishes here, but there is not much fruit land. Flocks of Kent sheep are kept on many farms. Some of the farmers here also have grazing land in Romney Marsh, which they work in connection with their arable farms with much advantage. It is usual for many farmers to put wether lambs and ewe lambs not required for breeding on corn or cake as soon as they will eat it, and fatten them out before they are a year old. Lambs are bought at the large fairs at Romney and Ashford in the early autumn for this purpose. There is some very useful pasture land on the Gault on the edge of the

[1] *Annals of Agriculture*, by Arthur Young, Esq., F.R.S., vol. ii., 1784.
[2] Boys, *General View of the Agriculture of the County of Kent.*

Chalk district between Folkestone and Ashford. Cattle are not bred extensively. There are two or three small herds of Shorthorns near Canterbury. Irish beasts are fattened in some cases, but not to any great extent. No Welsh cattle are now seen here.[1]

Between Deal and Sandwich, and above Sandwich and by the side of the river Stour from Canterbury, there is some useful land of alluvial nature, formed by the gradual filling up of this once wide and important river. This is marsh pasture-land, principally of good quality, though not equal to that of Romney Marsh, and is worked in useful conjunction with the arable land on both sides of the Stour. It will fatten $1\frac{1}{2}$ bullocks per acre, and carry $2\frac{1}{2}$ sheep per acre during the winter. Fruit is extensively grown near Sandwich. Fruit plantations have of late increased in this neighbourhood. Market gardening, too, is extensively carried on throughout this district, but foreign competition has reduced the profits of fruit and vegetable production. From Sandwich to Canterbury, below the line of the Stour there are deposits of loam and clay loam at frequent intervals, of varying quality and thickness, of the Thanet, Oldhaven, and Woolwich Beds. The cultivation and cropping are much the same in this district as in that south of Canterbury. The crops, however, are heavier generally, and the hop land is decidedly of better quality.

The best land in East Kent lies between Canterbury, Faversham, and Chatham, extending widely on both sides of the London, Chatham and Dover railway. It consists of rich deep loams of kindly working nature on the London Clay, and Oldhaven and Woolwich Beds. Large crops of grain are grown here. Barley and oats have in some degree superseded wheat. The barley is of excellent character, well coloured, well shaped, and much sought after by brewers. No regular rotation of crops is followed. The kind of crop is taken which will pay best. Radish seed, turnip seed, mangel seed, and other seeds are grown occasionally. Canary seed was grown formerly to some extent, as in other parts of East Kent, but it is rarely cultivated now, on account of the expense and foreign competition. Potatoes are somewhat extensively produced in parts of this district, which is very suitable for their growth, and large crops are obtained. Fruit is produced in enormous quantities, and of excellent quality, and the extent of fruit land is continually increasing. Among the fruits that especially flourish

[1] Buckland says, in his *Farming of Kent*:—"There are scarcely any cattle bred in the district; what few are fatted are of various breeds, but the Welsh predominate."

in this part are greengages, whose flavour is particularly good, and cherries, of proverbially fine quality, from which satisfactory profit is made.

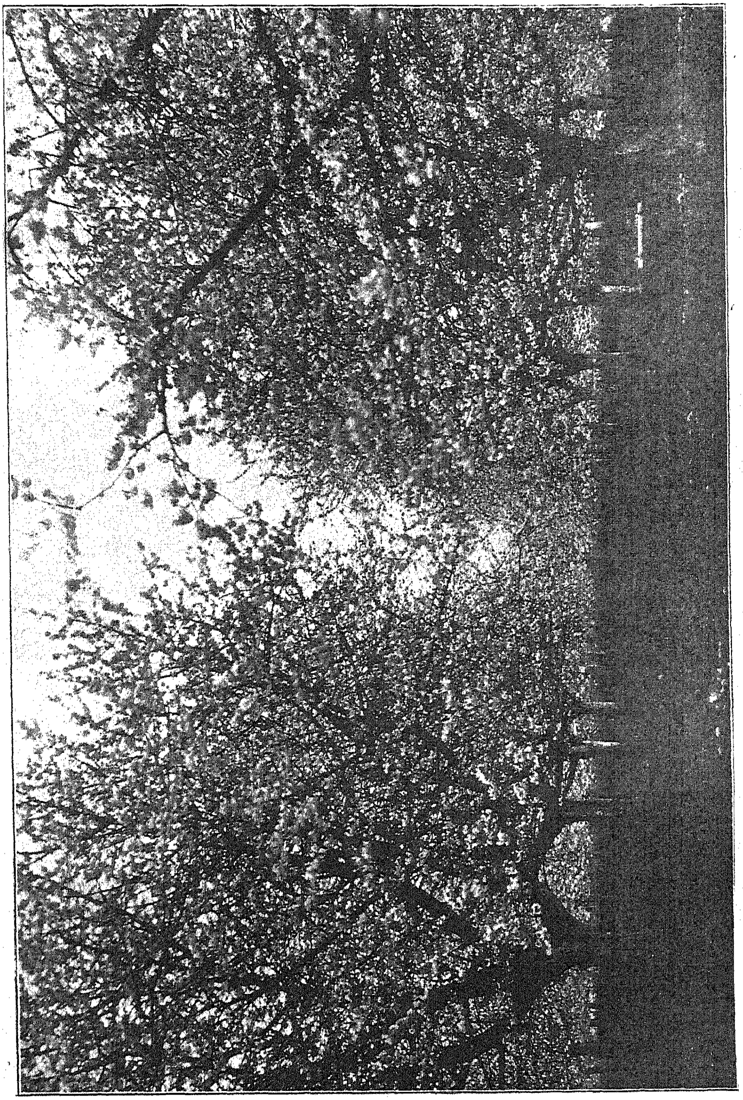


FIG. 2.— A Kent cherry orchard in full flower.

Lambarde remarks of this district of Kent, and particularly of Teynham, a village in the heart of it: "For heere have

wee not only the most dainty peice of all our shyre but such a singularitie as the whole British Iland is notable to patterne. . . . This Tenham with thirty other parishes lying on each side of the porte way and extending from Rainham to Blean Wood bee the cherrie gardein and apple orchard of Kent." He adds: "our honest patriote Richard Harrys (fruiterer to King Henry the 8), planted by his great cost and industrie the sweet cherry, the temperate Pipyns, and the Golden Renate. For this man seeing that this Realme which wanted neither the favour of the Sun nor the fat of the soile was neverthelesse served chiefly with that fruit from forrein Regions abroad, brought plantes from beyond the seas and furnished this ground with them." [1] Drayton rhymes of this fertile country:

> Rich Tenham undertakes thy closets to suffice
> With cherries, which we say the summer in doth bring,
> Whose golden gardens seem th' Hesperides to mock,
> Nor these the damson wants nor dainty apricock,
> Nor pippin, which we hold of kernel fruits the king.[2]

There are numerous cherry orchards, which are eminently things of beauty when they are in blossom, some idea of which may be obtained from the illustration (fig. 2) of trees in fulness of flowers, which appear before the leaves; and some landlords are increasing their orchards of this fruit, as the soil and climate suit it so perfectly. Very great improvement has taken place in the management of cherry orchards. They are never mown now. It was the custom to mow them, and Buckland remarks that "mowing the grass in cherry orchards is a most injurious practice, causing the fruit to fall before it attains maturity." [3] It is becoming understood also that grass allowed to grow close round fruit trees is prejudicial to fruit-bearing, and that in all cases it is utterly wrong to take hay crops from orchards, and even to feed animals on the grass without liberal supplies of cake or corn.

The finest hops in this county, and, as some hold, finer than in any other county or country, are produced here. Large flocks of sheep are kept, mainly of Kents, which are more suitable for this and other parts of the county than any other breed. There is no district in Kent where there are better flocks and better management of sheep, and there is a wide stretch of good pasture land in its northern part between Whitstable and Westgate, of great advantage to the more inland farms. Not many cattle are fattened, because there are great facilities for getting

---

[1] *A Perambulation of Kent*, by W. Lambarde, 1576, p. 222.
[2] Drayton's *Polyolbion*, the eighteenth song.
[3] *On the Farming of Kent*, by G. Buckland.

manure from London stables and cow sheds, which is less expensive than home-made manure. It may be said that in no district of Kent is farming in all branches so well done, nor any in which the farmers have as a rule maintained their own in spite of the general depression in agriculture.

There are, as has previously been stated, several herds of Shorthorns in East Kent, among which may be mentioned those of Mr. Collard of Little Barton, Canterbury, Messrs. Collard of Herne Bay, Mr. Amos of Wye, and Mr. Howe of Dover.

Mid Kent.

This important division extends westward from Lenham to Westerham, and is bounded on the north by Rochester and on the south by Tonbridge. The greater part of this division is upon the Lower Greensand formation. In the upper portion of it, and above the thin line of Gault which runs through it, as shown upon the map (fig. 1), there is a region of Chalk with surface soils of little depth and moderate fertility, while in its lower part the stiff soils of the Weald Clay prevail. The land on the Lower Greensand differs much in quality. This formation commences at Folkestone, between which and Ashford it is not more than two miles in width, with a surface soil of calcareous sand of fair agricultural value. Between Ashford and Lenham it is thin and poor. From Lenham the surface soil of the Greensand—formed by the detritus of the genuine Ragstone of the Hythe beds—begins, and extends through the division between the thin line of Gault and the Weald Clay to Ightham. At this place the more sandy, poorer soils of the Folkestone beds appear, and are found as far as Westerham, the extreme western limit of the county. In spots throughout the Greensand area there are layers of brick earth and of friable loams of fine quality, notably in the neighbourhood of Maidstone. And upon the sides of the hills overlooking the Weald of Kent, between the Hythe beds and the Weald Clay, there is a peculiar grey, sandy clay, known as Atherfield Clay, and locally as "Coomb," very fertile and suitable for filberts, black currants, and other fruit trees.[1] A good deal of the Weald Clay land in the Mid Kent division, especially at the junction between it and the better and lighter loams of the Lower Greensand, has been improved and lightened by the admixture, notably near Tonbridge.

[1] Buckland says: "There is a very narrow belt running along the escarpment of the Ragstone, provincially called Coomb, which, although of a very heavy and adhesive texture, is astonishingly productive in hops, fruit, and grain."

There is no regular rotation of cropping. Arthur Young remarks of the "vale lands near Maidstone" "the course of cropping was 1, turnips; 2, barley; 3, clover; 4, wheat; 5, oats; about Maidstone"; he goes on to say, "a great many hops are produced."[1] Marshall says, "in the ordinary practice, on the strong rich lands in the neighbourhood of Maidstone, beans, wheat, clover, wheat and clover, beans, wheat, clover and turnips, barley, clover, wheat; and on higher lands peas, wheat, barley appear to be adopted, tares or a fallow being occasionally thrown in."[2] Boys, speaking of a "beautiful farm near Maidstone," remarks that "a system of six courses is adopted, namely: turnips, barley, clover, wheat, beans, and wheat."[3] Upon some of the best land in the heart of the "Garden of England," as the Maidstone district has been called, wheat and beans alternated with each other for years without a break. The land was well manured for the bean crop with farmyard manure of the best type. But the price of beans and wheat fell so low, and the farmyard manure was wanted for the hops, that this rotation has been abandoned, and beans are rarely grown now. Barley is not grown, as its colour and form are not good enough for the more particular brewers of this generation, and it cannot compete with other barleys. The acreage sown with wheat has decreased, as in all the other divisions—not quite in such a degree, as there is a demand for straw for hoppers' bedding, and for sale. Oats are largely grown, and mangels, which have taken the place of swedes to a considerable extent. Sheep are not bred in numbers, but tegs are bought in the spring to be fattened in the autumn and winter. Comparatively few bullocks are fattened, as stable and cow manure are obtained in quantities by rail and river, and brought on to the farms by traction engines. Formerly almost every farmer tied up bullocks to make manure for the hop land, as a matter of course, and bought up animals of the Sussex breed from the Weald of Kent and Sussex breeders for this purpose. There was then some competition for the huge oxen cast, on account of age, from the teams of workers constantly used on Sussex farms in those days, upon whose enormous gaunt frames incredible heaps of flesh were piled with wonderful rapidity.

Cattle are bred somewhat extensively in Mid Kent. The principal herds of Shorthorns belong to Sir Mark Collet, Kemsing; Mr. Reeve, Brenchley; Mr. Palmer, Hadlow; Mr. Wightwick, Tonbridge; Mr. H. Leney, West Farleigh;

---

[1] *Annals of Agriculture*, by Arthur Young, Esq., F.R.S., 1784.
[2] *Rural Economy of the Southern Counties*, by Mr. Marshall, 1798.
[3] *General View of the Agriculture of Kent*, by J. Boys, 1796.

Mr. Harris, Tunbridge Wells. But there is no Shorthorn herd in Kent now that can in any way compare with the splendid herds of the late Mr. F. Leney of Wateringbury, of the late Mr. Betts, and of Mr. H. A. Brassey of Preston Hall. There are some excellent collections of Sussex animals, among which may be named the herds of the late Mr. F. Warde of Aldon, Mr. G. Warde of Tutsham, Major Best of Boxley, and Mr. Forster of Rumwood, Mr. Cornwallis, M.P., and the Hon. R. P. Nevill. Hops and fruit form the staple products. The acreage of the former has tended to decrease latterly on account of the low price obtained; but great additions have been made, and are continually made, to the fruit land in all parts of the division except on the Chalk soils. There are not many cherries produced here now. In the beginning of this century there were large cherry orchards on the sides of the Medway, but they were grubbed and planted with hops, and there is a growing disposition to replace the cherry trees in this suitable locality. Mid Kent has ample facilities for the conveyance of produce, manures, and other requirements by rail and by the river Medway, which is tidal as far as Maidstone or "Medwey's town,"[1] and a canal river thence to Tonbridge. Very much use is also made of traction engines.

North Kent.

The division of North Kent extends in a westerly direction to Bromley and from the bank of the Thames due south to the borders of the Mid Kent division. In the upper part the soil is good, as a rule, on account of the frequent outcrops of the Woolwich, Reading, and Oldhaven Beds, and London Clay. There is some useful land on the alluvium near the banks of the Thames.

But in the lower part of this division, where the Chalk is covered by its natural thin layer of soil—which in many cases, as in the district between Meopham and nearly to Farningham, is a stiff marl—the land is poor, cold, and unkindly. As in other parts of Kent, there is no regular rotation of crops. Those are taken which will pay best at the time. Woodland, which forms a considerable portion of the acreage, has been very much improved by filling up and replanting during the past forty years in consequence of the demand for hop-poles. Near Farningham and Horton Kirby the soil is lighter and of better

[1] Lambarde, in his *Perambulation of Kent,* says: "Maidstone, contractly for Medwey's Town," and Drayton sings of the Medway and Maidstone:

"Her only name she leaves, her only christened town."—*Op. cit.*

character, and the style of farming is higher. Sheep breeding and feeding are carried out on a large scale, and good crops are grown by means of folding and the liberal use of artificial manure and London dung. Wheat is not so much grown as formerly; oats, and barley which is of good malting quality, have taken its place to some extent. The Messrs. Russell, who are all now unfortunately dead, did much for the farming of this district by the introduction of sheep breeding and folding, and their example of enterprising husbandry. They brought into the county the West Country or Hampshire Down breed of sheep, which has proved most serviceable for breeding and folding purposes on the cold hillsides. Mr. Robert Russell, who for some years represented Kent on the Council of the Royal Agricultural Society, was the first to grow the useful and now widely cultivated thousand-headed kale and to demonstrate its value for sheep.[1]

The branch line of the London, Chatham, and Dover Railway to Sevenoaks and Maidstone is of great use to this district, and has caused great changes in its cultivation in the last twenty years. Upon the soils of the outcropping beds previously alluded to in the upper part of this division many vegetables and salad plants are produced, and potatoes are extensively grown. Tomatoes are also somewhat largely grown under glass. There is some useful pasture land, especially on the alluvium, and corn is grown also in some places, but the extent of this decreases as labour is dear and the prices obtained for it are unremunerative. Fruit has been planted on the most suitable land more or less throughout this district in the last twenty years. In the neighbourhood of the Crays, where the soil and situation, especially in the valley of the Cray, are extremely suitable, fruit-growing has increased in an extraordinary degree. There are outcrops of the Woolwich and Reading Beds and the Thanet Beds, which are shown on the map (fig. 1) extending from Woolwich to Orpington, whose better and more friable soils are well adapted for the growth of strawberries, raspberries, gooseberries, and currants. Some growers have as many as 500 acres planted with strawberries on these soils. For the fruit plantations in this locality quantities of London dung are brought by rail to Swanley Junction, and there are great facilities for the transport of produce to the London markets. Hops are grown to some extent in parts of this division, but not so largely as in the other divisions of Kent.

[1] *Sheep: their Breeding and Management*: a Paper read by Mr. Russell at the London Farmers' Club, April, 1876.

The Weald of Kent.[1]

This is an extensive division of the county running from Ashford to beyond Tonbridge, bounded on the north by the Mid Kent division, and on the south by the Sussex border. All the upper part consists of more or less heavy soils upon the Weald Clay, with patches of alluvium on the banks of the rivers Medway, Teise, and Beult. Mr. Topley says of this: "While stiffness and flatness are its prevailing characters, there are parts that are fairly hilly, and others which afford lighter soils. Both chiefly occur where the clay is overspread with gravel. . . The soil of the Weald Clay proper is a stiff yellowish clay, very poor in places, but, like most other clays, capable of great improvement. In places there are lines of lighter soil, caused by the outcropping of thin beds of sand, but they are not of great extent, and do not affect the general character of the district, which is stiff land excepting where overlain by loams and gravels."[2] A thin bed of loam, for instance, overlies the clay in the neighbourhood of Tonbridge, as may be seen on the map (fig. 1), and forms a rich, well-working soil, suited for the production of hops. In the southern part of this division the soils of the Hastings Beds occur. These beds crop up from under the Weald Clay in a line running south below Biddenden, Goudhurst, Brenchley, and Tonbridge, and there the soil changes from heavy clay to clay of a lighter texture with admixture of sand of the Tunbridge Wells Sand and occasional patches of loam. In this district, notably at Goudhurst and Brenchley, there is some very useful land where hops especially flourish. Fruit also does well upon these better soils, and considerable planting has taken place latterly. Apple trees thrive in most of the Weald of Kent district, on grass land where they are properly treated, but until somewhat recently they have been neglected and mismanaged.

Farms in the Weald of Kent are smaller than in other parts of the county. A good deal of land has been laid down to pasture. Some has laid itself down. The greater part of the land should, without doubt, be laid down. Fields are small; hedgerows are consequently numerous, and fatal to good and

[1] Hasted, in his *History of Kent*, points out that "Weald" is the Saxon term for a woody country. It was also termed "Wild." "There's a Franklin in the 'Wild of Kent' hath brought 300 marks of gold with him."—Shakespeare's *King Henry IV*.

[2] *Agricultural Geology of the Weald*, by W. Topley, F.G.S., Journal R.A.S.E. 2nd series, vol. viii., 1872.

profitable cultivation, and but little has been done to grub these and make larger fields.[1]

Most of the farms have a few acres of hop land upon them, which have, taking the average of the past thirty years, enabled many of the farmers to keep their heads above water. It is perhaps true that the other crops have been stinted in manure and good management on account of the hops, but since corn prices have been so low, cereal crops could not be made to pay in this heavy-land district. Buckland complained in 1845 that on the smaller farms of the Weald of Kent the small portion devoted to the growth of hops is highly manured and cultivated, while the rest of the land is suffered year after year to remain in a foul and exhausted condition.[2] There is no definite crop course in the Weald. Crops are taken according to circumstance and prices. A hundred years ago the systems of farming to be pursued by tenants were pointed out in their leases. The course usually was fallow, wheat, oats, clover or tares, for two or three years, and the tenants were bound to lay 100 bushels of lime per acre on the fallows for wheat; and Boys says "they generally put on double that quantity."[3]

Barley is not grown. Oats form the main corn crop. Wheat is grown mainly for the straw. Some farmers on the better land follow wheat by oats, with artificial grasses to renew for two or more years. Mangel is grown on the lighter soils. It is not a sheep-breeding district. A good many lambs are kept during the winter for the Romney Marsh graziers, and Kent sheep are bred and fed on the larger holdings. The Sussex breed of cattle is found on most farms, and some are bred in the division. The Weald of Kent was a great centre of iron manufacture, for which wood was used to such an extent that the woodland was cleared so rapidly that the nation was alarmed.[4] Wool manufactories were established at Cranbrook, Benenden, and Tenterden, and other neighbouring towns, according to Camden. The fine stone known as Bethersden marble is dug in the Weald of Kent about Bethersden, and was formerly highly esteemed, as it bears a fine polish. Hasted relates that "tombs and monumental pillars in most churches were made of it, and in most of the ancient seats chimney-pieces in the grandest apartments were of this marble."

---

1 Buckland says: "Not less, perhaps, than an eighth of the entire area of the arable land of this extensive district is occupied by hedges and trees."

2 *On the Farming of Kent*, by George Buckland, land-agent, Journal R.A.S.E., 1st series, vol. vii.

3 *General View of the Agriculture of Kent*, by John Boys.

4 Furley's *History of the Weald of Kent*, vol. ii., p. 484.

ROMNEY MARSH.

Romney Marsh,[1] the first of the subdivisions to be treated of, is situated at the end of the Weald of Kent, in the east of the county, just below Folkestone and joining Sussex at Rye. It is eight miles wide and twelve miles long, and comprises an area of about 45,000 acres, and, as Camden states in his *Britannia*, "hath been laid unto the lands by the benefit of the sea." Drayton thus rhymes of Romney Marsh:

> Appearing to the flood most bravely like a queen,
> Clad all from head to foot in gaudy summer green;
> Imbossed with well-fed horse, large sheep, and well-fed neat,
> Some wallowing in the grass, then lay a while to batten,
> Some sent away to kill, some thither sent to fatten.[2]

It is generally considered that the Romans first reclaimed parts of this district, but Mr. Smiles, in his *History of the Huguenots*, suggests that the Belgic Gauls who had settled in Kent before the Roman invasion first began this work, having brought the art of embanking from the Netherlands. In some parts of the Marsh, embankments or sea-walls have to be kept at considerable cost, rates or "scots" being levied on the land to defray this.[3] On the western side of it is alluvial soil collected at the mouths of the river Rother[4] and by the sides of its tributary streams. On the eastern side are deposits of alluvium with patches of peat, and a surface soil of rich clay loam. The land is divided by dykes which carry off the water into main water channels that drain into the sea. It is calculated that about one-fourth of this marsh only is in cultivation at this time, the rest being pasture land of varying quality. Much of it is of exceeding value, fattening sheep and bullocks very rapidly. Some of the best land will fatten out as many as ten sheep per acre during the summer. Most of this will fatten out four or five sheep and a bullock in ordinary seasons, and a surprising number of sheep can be kept per acre upon every part of it. Upon the ordinary

[1] From Rumonea, a large watery place, according to Hasted; but others hold that it is derived from Roman Ey, or Island of the Romans. Canon Jenkins, however, ascribes it to the name of a great Saxon landowner, a priest called "Presbyter Romanus."

[2] Drayton's *Polyolbion*, the eighteenth song.

[3] Lambarde, in his *Perambulation of Kent*, says:—"Romney Marsh is famous throughout the Realme as well for the quantitie and fertilitie of the soil and levell as also for the auncient and wholesome ordinances there used for the preservation and maintenance of the bankes and walles against the rage of the sea."

[4] This river, whose source is at Rotherfield, in Sussex, was known in ancient times as Limen, and was then far wider and more important. "The Rother through the Weald doth rove, till he with Oxney fall in love," as Drayton has it.

land five ewes and their lambs, or ten tegs per acre, are often kept from May till September, and during the winter $2\frac{1}{2}$ ewes are generally kept per acre. Lambs cannot be wintered in the marsh on account of its bleak situation, so that the graziers who have no upland farm near are compelled to put them out to keep during the winter, at a cost of from 5*s.* to 6*s.* per score per week, in Kent, Surrey, Sussex, and even in Essex and Hertfordshire. This is the weak point in Romney Marsh grazing, as the lambs are in many cases indifferently wintered; in September there is a regular exodus of healthy vigorous lambs from the Marsh, but when they return in April the numbers often have materially diminished, and some of the survivors are miserably poor. Buckland speaks of this in strong language:[1]—"Vast numbers of the tegs return to the marsh in a half-starved and debilitated condition." But there has been a considerable improvement in late years. In many cases corn or cake is given to the lambs, and they are now generally far better treated. The sheep, which are always of the Kent or Romney Marsh breed, have been greatly improved latterly, as will be mentioned subsequently (p. 480). In the prosperous time of agriculture, between 1865 and 1879, there was a great demand for Romney Marsh land; rents ranged between 2*l.* and 5*l.*, and even up to 8*l.* for very choice pieces of fatting land. Buckland put the rent at from 1*l.* 10*s.* to 3*l.*, and in some cases considerably higher. At this time these figures even are not reached, and in many cases land that was worth 100*l.* per acre in the prosperous days cited above would not make more than from 40*l.* to 50*l.* per acre. It is considered that the pasture land on the average has fallen 50 per cent. in value, and arable land close on 75 per cent. Most of this Marsh is drained, and to this the comparative immunity of the sheep from fluke is said to be due. But it is also due, it is considered, in a great degree to the prejudicial effect of the salt from the sea upon the freshwater snail *Limnæa truncatula*, which is the intermediate host of the fluke, *Distoma hepaticum*.

The arable land is stiff, rich, alluvial clay, with an admixture of dry peat in places. It yields huge crops of wheat straw, though the wheat is not of the best quality, and its yield is disproportionate to the straw. There was a ready sale for the straw grown in Romney Marsh to Army contractors at paying rates, and much of this went to Aldershot; but the demand has ceased, and straw is now extensively imported from France for contract purposes. Oats are largely grown. Mangel, turnip, and radish seeds are grown by contract with seedsmen, to a very considerable

[1] *On the Farming of Kent*, by George Buckland, land-agent.

extent, and this is generally profitable, though involving a good deal of trouble and requiring much labour, which is becoming a scarce commodity in the Marsh. Forty years ago, when corn-growing paid well, a good deal of the less valuable pasture land was broken up. Now the arable land has been lately laid down again with grass; but it is a singular fact that grass does not lay down well upon the land in the Marsh that has been cultivated.

The Isle of Thanet.

The Isle of Thanet, situated in the north-eastern part of Kent, is about 29,000 acres in extent. Hasted writes[1] of its name as follows: "Julius Solinus is the first of the Roman writers who mentions it by the name of *Athanaton* and Thanaton. The Saxons afterwards called it Teneth and Tenetlonde." Lambarde says Thanet, or "Tanet," is derived from a Saxon or old English word signifying "moisted, or iled round about." Lewis holds that Tenet, Tened, Tanet, Tanettond, Thanet is so called from the Saxon word Téne, a fire or beacon, on account of its being so full of beacons to give alarms of the "invasions of Danes and other pirates."[2] It was divided from the continent or main land, Lambarde adds, "by the river called Wantsume, which was about 3 furlongs broad and to be passed over in two places only."[3] This once wide water has become a comparatively narrow stream, with breadths of marsh pasture land below Minster, so valuable to the occupiers of the arable land on either side. The Wantsum is a branch of the river Stour, flowing northwards and entering the sea near the Reculvers, and the main river Stour flows eastward to the sea at Pegwell Bay. As Drayton rhymes:

> Which having said, the Stour to Teneth doth him hie,
> Her in his loving arms embracing by-and-by.
> Into the mouth of Thames one arm that forth doth lay,
> The other thrusting out into the Celtic Sea.

In the whole of the flat district in the southern part of the Isle of Thanet the soil is that of the London Tertiaries, and of alluvium on the borders of the river channels, and is of useful quality for grazing purposes, and for the growth of vegetables. Some land has lately been planted with fruit in suitable and sheltered situations, and seems likely to prove profitable. Above the Stour there is an outcrop of the Chalk formation. Mr.

[1] Hasted's *History of Kent*, 1800.
[2] *The History of the Isle of Thanet, in Kent*, by John Lewis, M.A., 1723.
[3] *The Perambulation of Kent*, by W. Lambarde, Gent., 1576.

Whitaker speaks of this as a separate northern outcrop of Chalk, owing to a rise of the bed in that direction.[1] The overlying soil is not thick, as a rule, over the Chalk, and the good quality of the greater part of the soil is not due to the overlaying of soils of the Thanet Beds upon the Chalk, for, although the name of these beds originated from Thanet, as Mr. Whitaker remarks, "a very trifling fraction of the area of the Isle of Thanet is formed of these beds, and so the name may at first mislead." These beds only overlie the Chalk on a mere strip along the southern edge of Thanet. Lewis, in his quaint and exhaustive history, writes: "But the greatest part of the island is chalky light land, and a wet summer is reckoned most kind for it, which, being prejudicial to the other parts of the kingdom, has occasioned the following proverbial rhyme among the inhabitants:

When England wrings,
The island sings."

Though this soil is not deep, it is most fertile, not by reason of its natural merits, but because it has been manured copiously with sea-weed for centuries, and has always been farmed highly and well. The description of it by Camden in 1551 is also applicable to the present period: "The Isle of Thanet is a most fruitful spot, cultivated in every part with corn or garden stuff. Very little wood, the farms large and considerable." Hasted corroborates Lambarde, Camden, and Lewis, and says the soil here has always been remarkable for its fruitfulness. "*Felix tellus Tanet sua fecunditate*, says the monkish historian, and modern writers speak of it in equal terms of praise."[2] It is supposed that as a considerable portion of Thanet belonged at one time to religious fraternities, their well-known good cultivation and management permanently enriched and improved the land in the neighbourhood of the monasteries. According to Boys, much of it is naturally very thin light land, but the greater part of it having belonged to the religious, who were the wealthiest and most intelligent people, and the best farmers of the time, no cost or pains were spared to improve the soil.[3]

At the present time the whole district is well farmed and, generally speaking, without any special rotation. Barley is the staple crop, as it is produced in heavy yields and of the finest quality. Barley frequently succeeds barley. Oats do well, and yield satisfactory crops. The cultivation of wheat has considerably decreased, though the crops are heavy, and the grain is good.

---

[1] *Memoirs of the Geological Survey of England and Wales.* "The Geology of the London Basin," by W. Whitaker, B.A., London, 1872.

[2] Hasted, *op. cit.*

[3] Boys, *Survey of the Agriculture of Kent*, 1796.

It is grown mainly for the sake of the straw, for which there is a great demand. There are several large dairies in various parts of this district, especially in the vicinity of the towns of Ramsgate, Margate, Broadstairs, Westgate, and Birchington, where quantities of milk are required for the thousands of visitors who flock thither. Near these towns market gardening is carried on somewhat extensively, and many of the farmers grow vegetables and salad to supply the demands of the towns. Fruit is not cultivated to any extent in the upper parts of the island, but round Minster and in sheltered places fruit plantations have been made. Lewis stated in 1723 that "fruit trees thrive very well on the sheltered south and south-west sides of the island." Canary, caraway, and coriander seed were grown when Camden wrote in 1551, and when Boys wrote in 1796. Buckland states that the culture of caraway and coriander seed was extant in 1845, and that canary seed was cultivated to a considerable extent. Now the cultivation of these seeds has almost entirely ceased, and mainly on account of foreign competition. A description of canary-seed culture is given by Lewis in his *History of the Isle of Thanet*, which shows that upon pasture land ploughed up canary seed was taken for 8 or 10 years, the land being too rich to grow wheat. Six gallons of seed were sown per acre in March, and the crop was about 4 qrs. per acre. Radish seed is still grown, and many other seeds for seedsmen, including flower seeds; and it is not uncommon, for instance, to see fields of sweet peas grown for their seed. The acreage of hop land has become larger latterly, as hops of fine quality and fair quantity are grown in the sheltered spots. Taking the island of Thanet as a whole, it is still well farmed, even in these days of agricultural depression, of which there are comparatively few indications. Boys asked, more than 100 years ago, whether there was "another district in Great Britain or the world of the same extent in such a state of cultivation, where the farmers are so intelligent and wealthy, where land naturally of inferior quality is let for so much money and produces such abundant crops." [1] The answer to this question, if put now, would be that it would be difficult to find a better cultivated district.

The Isle of Sheppey.

The Isle of Sheppey is an island of great natural fertility cut off from the mainland by the Swale Channel, which is said to be an old arm of the Medway.[2] The Saxons styled it Scæpige, or

[1] Boys, *Survey of Kent.*
[2] *Memoirs of the Geological Survey of Great Britain.*

Ovinia, the island of sheep, on account of the number of sheep feeding upon it, and the renown of their wool. Lambarde says: "It should seeme by the dedication of the name that this Ilande was long since greatly esteemed either for the number of the sheepe or for the finenesse of the fleese." [1] Drayton also speaks of "Shepey":

> With sheep hook in her hand,
> Her goodly flock to heed,
> And cherisheth the kind of those
> Choice Kentish breed.[2]

It is connected with the mainland by ferries and by a movable bridge of the London, Chatham and Dover Railway, and contains about 22,000 acres of land. The soil is principally strong clay and stiff clay loam of the London Clay, which attains its greatest development there, being from 470 to 480 ft. thick. There is some alluvial soil on the west and south of the island, and upon this there is a good deal of marsh pasture and pasture land on the borders of the Swale channel. Most of the land works heavily, and, as a writer puts it, is so sticky that the plough wheels get loaded. The rotation of wheat and beans following prevailed when Boys wrote; and in 1845 Buckland describes the cropping as the summer fallow dunged or limed, beans, wheat, beans and clover, wheat, oats. But in some cases tares, mangels, carrots, &c., supersede the summer fallow. At present the course of some farmers is: 1. Spring tares. After this the land is ploughed well and ridged for the winter. 2. Barley or oats. 3. Beans with a good dressing of farmyard manure. 4. Wheat with seeds. 5. Wheat. 7. Oats or barley. Others take wheat followed by barley and oats, then beans or peas or clover. Wheat, barley, beans, or tares follow. A practical farmer writes: "The old style of cultivation, wheat and beans, is about the best, consequently Sheppey suffers severely from the low prices of wheat and beans." Canary-grass was formerly grown extensively for its seed, but is now rarely cultivated. Some mangels are grown for cows and for feeding sheep. Seeds of mangel, swede, and turnip are extensively produced here, in some cases being grown by contract for seedsmen, but very little radish seed is now grown. Sheep are extensively bred and fed on the marshes and pastures, but the arable land is too heavy for folding off turnips in the winter months.

The depreciation in the capital value and the rent of land in Sheppey is greater than in any other part of Kent. To give an illustration: a farm of 502 acres with 13 cottages tithe free was

[1] Lambarde's *Perambulation of Kent.*
[2] Drayton's *Polyolbion*, the eighteenth song.

let at 1,120*l.* during the good times. When the first pinch came the rent fell to 700*l.*, and in 1893 only 300*l.* was obtainable. The farm was in hand until last year, when a tenant agreed to give 550*l.* per annum for it. But there is a good deal of land still in the owners' hands, or let at rents very much under that quoted above, and the decrease in the capital value and rental of the land may be put at over 50 per cent. There are great complaints of the scarcity of labour and of the falling off in the quality of the work done by labourers. It is of interest to note here that Gerarde, in his *Herbal*, written in 1597, speaks of several plants of not common species being found in the Isle of Sheppey, as well as in the Isle of Thanet. Camden also gives a list of plants found there. Among these are frosted sea Orache, *Atriplex arenaria*; stalk-fruited sea Orache, *Atriplex pedunculata*; branched broom rape, *Orobanche ramosa*; and others.

THE HUNDRED OF HOO.

The Hundred of Hoo, or "How," or "Ho," as it was formerly termed, and so called from the Saxon word *How*, signifying high, lies between Gravesend and the Isle of Sheppey. It is a peninsula bounded on the south-east by the Medway and on the north by the Thames. The soil is clay and loamy clay on the alluvium near the rivers, and on the London Clay in the other parts. In some places the land is like that of the Isle of Sheppey, being heavy and difficult to work in wet seasons. According to an old writer,

> He that rideth into the Hundred of Hoo,
> Beside pilfering seamen shall find dirt enoo.[1]

But it has been made much better in these later days by draining, and in average seasons very heavy crops are grown. Upon parts of this district there is good working land of very useful character. Wheat does well here, large yields of grain of quite average quality and good weight being produced, with long straw. Barley gives very fine crops, but the best malting samples are only grown on the soils of medium texture. The corn crops are generally taken after potatoes, which are largely cultivated in the Hundred. Cabbages of all kinds are cultivated for market, planted between early potatoes, and peas for podding. Radish seed, mangel seed, and swede seed are largely grown. A good crop of radish seed is about 24 bushels per acre; of swede

[1] *The Chronicles of Englande, Scotlande, and Irelande*, by R. Hollinshed, 1577.

seed, about the same quantity; and of mangel seed close on a ton per acre. Sheep cannot be folded on the heavy land, and large quantities of young sheep are sent away for the winter, and are brought back again about the middle of April. Fruit of all kinds is grown in the district of Hoo proper, but not in other districts of the Hundred of Hoo. There are only about 30 acres of hops. There is some very useful pasture, or marsh pasture, on the alluvial soil, upon which Kent sheep are kept. As in Sheppey, the heavy arable land does not take to grass well. Water is also short in the centre of the Hundred. The rent of land has fallen at least 50 per cent. About 1*l.* per acre

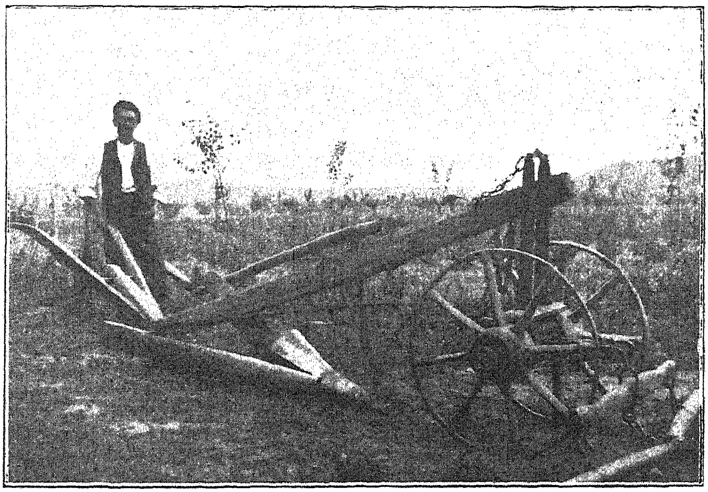


FIG. 3.—A modern Kent plough.

is quite the average rent now; ten years ago 2*l.* per acre was easily obtained.

Labour is a most serious question, both here as well as in all parts of Kent. The difficulty of the situation is intensified in Hoo and the Isle of Sheppey by reason of their lonely and isolated position, which makes all the young men leave their homes directly they can earn their own living. The desire for constant amusement and recreation which influences the rising generation in all classes leads the children of agricultural labourers to seek for employment in the towns, where they can see life, and get fewer hours of work and more pay than agriculturists can afford. It is most difficult throughout Kent, as it is in many other counties, to get lads to "go with the horses,"

which was the ambition of most boys forty years ago. In the Hundred of Hoo, in the Isle of Sheppey, and in the districts between Maidstone and Rochester and Gravesend and Crayford, there is a great demand for labourers for cement-work, brick-fields, and other industries, where from 4*s.* to 6*s.* per day can be earned. In some parts of these districts there are large Government works, where workmen are constantly required, and where the wages paid are far higher than agriculture can bear. In the parts of Kent near London the scarcity and dearness of labour press hard on farmers, and in places in East Kent near the populous towns there are growing complaints of the cost of labour; whilst in the quiet country villages of this district, and in those of Mid Kent and the Weald of Kent, if there are no waterworks, railways, light railways, or similar works in course of construction, to com-

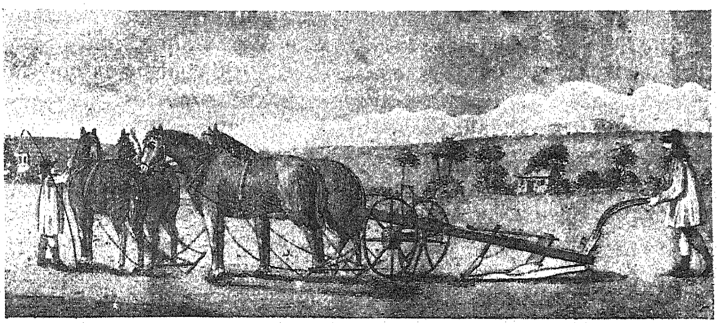


FIG. 4.—A Kent plough 100 years ago.

pete with agriculture, the spirit of unrest moves the younger members of the labourers' families to leave their homes for fresh fields and pastures new. Men are wondering in all parts of the county where the next generation of farmers in Kent will obtain workmen to till their land, to look after their horses, and mind their flocks and herds; and not only is the supply of labourers becoming less every year, but the quality of the work has much deteriorated, and it is most difficult to find men having technical knowledge of the more important operations of agriculture.

Wages range between 14*s.* and 18*s.* per week according to the districts. Thus in the Weald wages are not so high as in Mid and parts of East Kent. Much of the work, however, is done by the piece, especially in the hop and fruit plantations, and a good man can earn from 3*s.* 6*d.* per day. Women get

from 1*s.* 4*d.* to 1*s.* 8*d.* per day, and earn much more at hop-tying and fruit- and hop-picking.

The implements and machinery in use throughout Kent are similar to those in other counties, at least upon the arable and grass land, except as regards the plough—the Kent wooden turn-wrest plough, which has held its own against all iron and patent competitors, and is employed by the majority of farmers in Mid Kent and the Weald of Kent. On the lighter land in East Kent and the more sandy soils nearer London iron ploughs are seen worked with two horses. With the Kent plough (fig. 3) all the furrows are turned one way by means of shifting mould-boards. Its share is merely a somewhat flattened point without wings, which tears up the soil, leaving a crumbly bed. Marshall calls it "this magnificent implement." Some writers and strangers to Kent have rather laughed at it, but in stiff land, and land where Kentish Rag crops up, no other implement could work as well. As may be seen from the illustration (fig. 4), there has been but little alteration in this implement since Boys described it in 1796, but it is now for the most part worked by three horses, except on the heavy soils of the Weald. An admirable cultivator is made by removing the mould-boards and fixing to the share a plate of iron steeled at the edges, four or five inches broad, and twenty inches long and shaped like a crescent. This thoroughly moves and disintegrates the soil, and cuts off every weed. In connection with hop cultivation there are ingenious machines for syringing hop plants by hand or with horses, which were tried at the Show at Maidstone, also for applying sulphur to hop plants.[1]

Hops.

Although hop cultivation in Kent has not yielded much profit during the last five years, it has been the source of great wealth to the county for a long series of years, and even taking the average of the last five years it has been the means of keeping many of the farmers' heads above water. In some years the returns of the hop crop per acre have been enormous, far surpassing those of any other agricultural crop, and this has sometimes led to planting hops upon land that was not suitable for their growth, and has induced farmers to embark upon this costly business without sufficient capital. Hop-

[1] A detailed account of these is given in a paper in the Journal R.A.S.E., 3rd series, vol. ii., 1891, entitled "Methods of Preventing and Checking the Attacks of Insects and Fungi," by Charles Whitehead, F.L.S.

growers on suitable soils, however, who have resisted the temptation to plant hops beyond their capital, who have farmed well, and who have not speculated by holding their produce for better than current prices, have done well, taking one year with another. Without hops, fruit, and vegetables Kent would have felt the depression in agriculture quite as much as any county in England, as there is so much poor land within its borders, and—excepting in districts especially well farmed, like the Isle of Thanet—many of its agriculturists who have neither hop nor fruit land have either succumbed or are in a sorry plight.

Hops were introduced into Kent in the fifteenth century, having been "fetched out of Flanders." A petition was presented to Parliament in 1442 against "the wicked weed" the hop plant. It is found that hops are first mentioned in English statutes in 1552, and in 1603 penalties were imposed on the importation of spoiled hops. Hop growing seems to have been well established in the latter part of the sixteenth century, as Reynolde Scott describes the cultivation of hops in Kent in his black-letter pamphlet "A Perfite Platforme of a Hoppe Garden."[1] There are records of hop gardens near Canterbury in the reign of Queen Elizabeth. At the end of the last century there was a large hop acreage in the county. Arthur Young wrote in 1804, "Hops are very much cultivated in this county." Marshall says, "For a few miles round the town of Maidstone the entire country might be termed a forest of hops. . . . There is an instance of one man in 1790 cultivating 130 acres of hop gardens."[2] The acreage of hop land in Kent has always been greater than in any other county. In 1863, when the first returns of the hop acreage were made, there were 36,367 acres; in 1873, 39,040 acres. In 1878 there were 46,593 acres—the highest acreage known in Kent. At the present time there are only 30,941 acres. The hop grounds, or hop gardens, as they are called in Kent, of poor character and least suitable for hop production have been gradually grubbed since 1890, on account of large crops, the importation of hops, and low prices. The tendency now is to plant hops again after the short crops of the last two years and the decided improvement in prices. At the beginning of the present century there were 290 parishes in Kent in which hops were

---

[1] *A Perfite Platforme of a Hoppe Garden, and necessarie instructions for the making and maintenance thereof, with notes and rules for reformation of abuses commonly practised therein, very necessarie and expedient for all men who have in any wise to do with Hoppes.* Imprinted in London by Henrie Denham, dwelling in Paternoster Rowe, at his signe of the Starre, 1576.

[2] Marshall's *Rural Economy of the Southern Counties* (District of Maidstone), 1798.

cultivated. Now, as may be seen on the accompanying map[1] (fig. 5), there are, out of the 413 parishes in the county, 331 parishes where hops are grown. Kent is divided, as shown on this map, into four districts, East Kent, Bastard East Kent, Mid Kent and the Weald, and the hops respectively produced in these are classified in the hop markets accordingly, viz. "East Kents," "Bastard East Kents," "Mid Kents," and "Wealds." The relative values of these four divisions follow in the same order, East Kents making the highest and Wealds the lowest rates. These divisions agree in the main with those defined by geological formations. Thus, "East Kents" are grown upon the Chalk, and especially on the outcrop of the soils of the London Tertiaries upon the Chalk. "Bastard East Kents" are produced on alluvial soil and soils formed by admixtures of loam, clay loams, chalk, marl, and clay from the Gault, Greensand, and Chalk. "Mid Kents" are derived principally from the Greensand soils and outcrops of the London Tertiaries in the upper part of the district.[2] "Wealds" come from soils on the Weald Clay, Hastings Sand and Tunbridge Wells Sand.

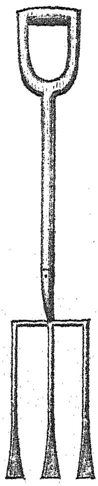


FIG. 6.—A hop spud.

As each "pocket" of hops must be marked with the owner's name and the parish in which they were grown, buyers of hops can ascertain from which of the four divisions hops come without much trouble, especially if they have the map (fig. 5), which gives the name of each parish.

There has been a considerable rearrangement of the hop plantations in Kent during the last few years. Common varieties, as Colegate's, Jones's, Grapes, and Prolifics, have been grubbed, and Goldings, Bramlings, and other choice kinds planted in their places. The variety known as Fuggles, a heavy cropping though slightly coarse hop, has been much planted in the Weald of Kent, and in parts of Mid Kent, where the soil suits. In very old hop gardens, where there has been no change of plant for 50 or even 100 years in some instances, except from the gradual process of filling up the places of plants that have died, there has been replanting with better varieties, and varieties ripening in better succession; and, generally speaking, the

[1] Messrs. Arthur Morris & Co., 19 Southwark Street, S.E., have courteously allowed the writer to reproduce this map from their elaborate series of maps of the hop-growing parishes of England.

[2] Sometimes "Mid Kents" are divided into "Mid Kents" and "North Kents," the former coming entirely from Greensand soil, and the latter from Chalk and London Tertiary outcrops.

plantations have been levelled up in this respect to suit the demand for bright hops of fine quality.

The cost of cultivating and preparing the produce of an acre of hop land tends to increase on account of the advancing rates of wages, the intense cultivation more and more essential, and the necessity of freeing the plants from the persistent attacks of insects and fungi. Marshall estimated that the average cost of an acre of hop land was about 26*l.* in 1795.[1] Buckland computed the cost at about 32*l.* per acre in 1845.[2] Whitehead considered that the average cost in 1890 of cultivating and preparing the produce of an acre of hop land was 36*l.* 1*s.*[3] At the present time the average cost in Kent is quite 37*l.* per acre.

The hops in Kent are usually planted in October or November, the plants being 6 feet apart each way, giving 1,210 hills or plant centres per acre. Some planters still grow potatoes or mangels between the rows the first year, as the plants do not bear much until the second year; but it is felt that this is a mistake, as it encourages wire-worm and exhausts the ground. Many Kent planters pole hop plants the first year with a single short pole, and stretch cocoanut fibre string from pole to pole, and grow many hops in the first season.

Much of the hop land is ploughed between the rows now that labour is scarce, and the spaces between are dug afterwards. It is far better to dig hop land if possible. The tool used for this is the Kent "spud" (fig. 6). The cost of digging an acre ranges between 18*s.* and 21*s.* Hop land is ploughed or dug between November and March. After this the plants are "dressed," which means that all the old bine ends are cut off with a sharp curved hop knife, and the plant centres kept level with the ground. Manure is applied in the winter, and dug or ploughed in. London manure from stables and cowhouses is used to an enormous extent. It comes by barge or rail, and is brought from the wharves and stations by traction engines, and costs from 7*s.* 6*d.* to 9*s.* per load. Rags, fur waste, sprats, wool waste, and shoddy are also put on in the winter. In the summer rape dust, guano, nitrate of soda, and various patent hop manures are chopped in with the Canterbury hoe (fig. 7). Fish guano or desiccated fish is largely put on now by Kent hop growers. It is very stimulating and more lasting than some of the other forcing manures. Tying the bines to the poles or strings is essentially women's work. It was formerly always piecework,

[1] Marshall's *Rural Economy of the Southern Counties*, 1795.
[2] Buckland's *Farming of Kent*, 1845.
[3] *Fifty Years of Hop Farming*, by Charles Whitehead, F.L.S., F.G.S. Journal of the Royal Agricultural Society of England, 3rd series, vol. i., 1890.

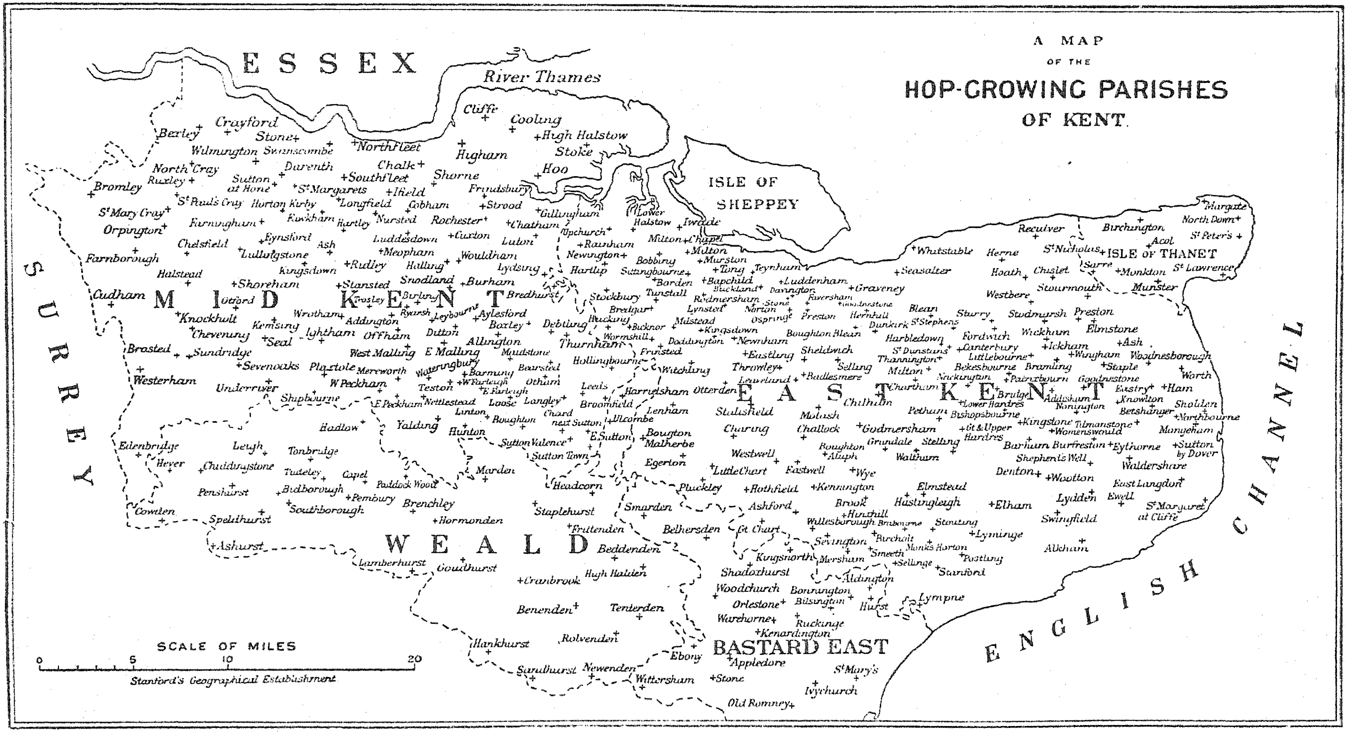


FIG. 5.—Map of the Hop-growing parishes of Kent.

[To face p. 458.

or "great work" (*Kentice*), each woman taking so many acres to tie. Now it is found better to pay the women 1*s*. 8*d*. to 2*s*. per day, that they may all work together, and tie the plants in those grounds where they want tying at once. The new modes of poling or training hop plants have also altered the conditions of tying.

Many improvements have been made in the methods of poling and training hops. Formerly two or three poles were placed to each hop hill or plant centre in the spring, and removed in the winter, and this was the only mode of training. Recently systems of training on wires and strings fastened to permanent upright poles have been introduced. One arrangement of wires and strings much adopted consists of stout posts set at the end of every row of hop hills and fastened with stays to keep them in place. At intervals in each row a thick pole is fixed. From post to post in the rows a wire is stretched at a height of half a foot from the ground, another about six feet from the ground, and another along the tops of the posts, so that there are

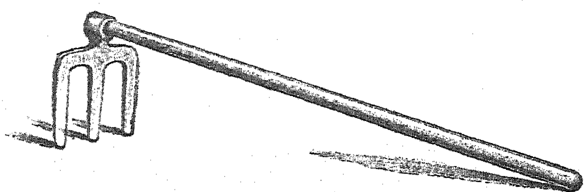


FIG. 7.—The Canterbury hoe.

three wires. Hooks are clipped on these wires at regular intervals, and cocoa-nut fibre strings are threaded on them and fastened from wire to wire, and from post to post, to receive the hop-bines. The string is threaded on the hooks continuously, and is put on the hooks of the top wire with a machine called a stringer. There are several methods of training hops with posts or stout poles, wire, and string, whose first cost varies from 20*l*. to 40*l*. per acre. An illustration of one of these is given in fig. 8. The system is cheaper in the long run than that of taking down the poles every year, and the wind does not blow down the poles or injure the hops by banging the poles together.

Another method, shown in fig. 9, is now extensively made use of in Kent and Sussex. Stout posts are placed at the ends of each row of plants, and at intervals where requisite. Wires are fastened to the tops only of these posts, and cocoa-nut fibre strings are fastened by pegs to the ground close to each hop stock (*a*, *a*, *a*), and to the wires at the tops of the posts, at *b*, *b*, *b*. This is more simple and less expensive than

the first described system, its cost being from 24*l.* to 28*l.* per acre. In this case the plants require to be well "lewed,"[1] as the strings being so light are blown about by the wind. These methods are being largely adopted, and together with the practice of putting cocoa-nut fibre strings from pole to pole in grounds poled in the old-fashioned manner, are most important improvements in hop culture, which have greatly tended to increase the production of hops. Where the old system of poling with two or three poles is still adhered to they are always creosoted, most growers having tanks for the purpose, and in the new methods of poling the posts and poles are creosoted, dipped, or kyanized. A good deal of attention is required to keep the bines in their places on the poles, strings, or wire, during the summer. This gives employment to many women, for whose service in this and fruit picking there is a great demand, and a woman has no trouble in earning from 1*s.* 6*d.* to 1*s.* 10*d.* per day from April till September at pleasant and not very arduous labour. The hop picking comes on then, and at this women sometimes get 4*s.* and even 5*s.* per day. This is the real Kent harvest. It has been much curtailed of late. It formerly lasted a month or five weeks; now it rarely extends beyond eighteen days, as it is important to secure the hops before the weather and the aphides, which now almost invariably swarm within the bracts of the cones, discolour them, and spoil their sale, as brewers will have bright "coloury" hops in these days. Picking is better done now. The hops are picked more singly, and with comparatively few leaves, and the pickers are of a somewhat better type than the rough hordes who formerly came into Kent for "hopping" at their own sweet will. Kent planters engage their pickers beforehand, and write to them, arranging the numbers required, with the date of picking. Many families come into Kent for pea and fruit picking and remain for hop picking. Without this great immigration of numbers, variously estimated at between 45,000 and 65,000, the crops of hops could not be picked, and fruit farmers would be also unable to get their soft fruit gathered in time without the help of immigrant hands. And it must here be said that the fruit growers and hop planters of Kent have during the past forty years greatly improved the accommodation for these immigrants.

Hops when picked are taken in pokes, long sacks holding ten bushels, to the oasts[2] to be dried. Oasts are

[1] "Lew," sheltered; an house is said to "lye lew, *i.e.* the house lies snug under the wind."—Pegges' *Alphabet of Kenticisms.*

[2] It is suggested that oast is derived from the Latin *ustus*, burned. It is not peculiar to hops, as the word oast was known before hops were dried. Lime

circular or square kilns, or groups of kilns, in which the green hops are laid upon floors covered with horsehair, under which are enclosed or open stoves or furnaces, from which heat is evenly distributed among the hops above by draughts below and round them. This is the usual simple arrangement. Patent processes are adopted here and there, but are by no means general. The hops are from nine to ten hours drying, after which they are taken off the kiln and allowed to cool somewhat, and are then packed tightly into pockets 6 feet long and 2 feet wide, weighing one and a half hundredweight, by means of a hop-pressing machine, with cogs and wheels worked by hand.

FIG. 8.—A method of permanent Poling.

More care has been latterly taken by some leading hop-growers in the drying of hops, so as to preserve their qualities and volatile essences, and to meet the altered requirements of brewers, who must have bright well-managed hops for the production of light clear beers for quick draught; but there is still very much improvement desirable in the science and practice of drying hops.

Hop-drying is done by ordinary Kentish labourers without any technical teaching, or the faintest ideas of science on the

oasts for lime burning are mentioned in records and deeds in the fourteenth and fifteenth centuries. Limehouse, in London, is said to have been so called from Lymost: lime oast.

subject, and it is wonderful how well, on the whole, drying has been effected, and how few hops have been spoiled from being underdried or overdried. This work has not been generally done quite so well or so carefully in the last few years, and this may have been more noticeable because buyers of hops have been much more particular as to the manner in which hops are dried.

The difficulties and expenses of hop-growing have been increased in recent years by the regularly recurring attacks of aphis blight, which make it necessary to spray or syringe every hop plant, every branch and leaf, with quassia and soft soap compounds three or four times, and frequently more often, in each season. This operation requires many labourers, and takes the hands away from the other work of the farm. It is sometimes performed with hand engines—large garden engines

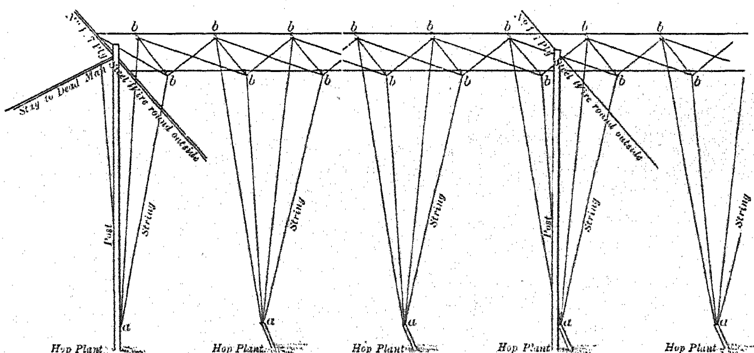


FIG. 9.—Arrangement of Wires and String.

—more frequently with horse engines, and occasionally with steam engines, which force the spraying solution up pipes laid between the rows of hops. The fear of mould or mildew, caused by the fungus *Podosphaera castagnei*, also entails the frequent application of sulphur twice or thrice, or even more often, in July and August, which is made by a machine furnished with a revolving fan drawn by a horse between the rows of hop plants. Before the importations of hops from America had become large an occasional aphis blight or fungoid attack was not an unmixed evil, as it lessened the crop and made prices better, and if the colour and quality of the hops were injured, they were saleable at remunerative rates, as brewers were not then so particular, and there were comparatively few foreign hops. Now, however, home growers strain every nerve to produce large crops of "coloury" hops full of aromatic and lupulinic essences, to

compete with those imported from America and Germany, where every effort is made to secure the British trade. It is considered that if the acreage of hop land is restricted to the present or about the present limits, and only the best sorts of hops are cultivated and prepared with skill in order to meet the requirements of modern brewing, hop-growing will pay well in Kent, taking the average of seasons. It is not necessary to describe the cultivation and management of hops in Kent at any greater length, as a detailed account of these was given in the Journal in 1893,[1] and has since been issued in pamphlet form.

Fruit.

Kent has been famous for its fruit for many centuries, and seems to have been the centre for the distribution of trees and grafts throughout the country. Lambarde, the Kentish historian, points out—as mentioned before in the description of East Kent—that Richard Harris planted various kinds of fruit trees at Teynham in that district. He remarks that the plants which our ancestors brought hither out of Normandy long ago had "lost their native verdour, whether you did eat their substance or drink their juice which is called cyder," and Richard Harrys obtained "105 acres of good ground in Tenham, which he divided into ten parcels and brought plantes beyond the seas and furnished this ground with them." In a rare black-letter tract, brought to the writer's notice by Sir Ernest Clarke, entitled *The Fruiterer's Secrets*,[2] dated 1684, signed N. F., allusion is made to Kent as the headquarters of fruit-growing. In this it is said of the Teynham ("Tenham") orchard: "Which orchard is and hath been from time to time the chiefe mother of all other orchards for these kindes of fruites in Kent, and of divers other places. And afore that these graftes were fetched out of France and the Lowe Countries, although that there was some store of fruite in England, yet there wanted both rare fruite and lasting fine fruit." Jeremy Collier, in his Dictionary, 1688, says: "Another thing peculiar to this county is its great plenty of the best cherries and pippins in England." Gerarde, in his *Herbal*, 1597, has it that "the tame and graffed

[1] *Hop Cultivation*, by Charles Whitehead, F.L.S., F.G.S., Journal R.A S.E., 3rd series, vol. iv., 1893.

[2] *The Fruiterer's Secrets*: Containing directions, for the due time, and manner, of gathering all kindes of fruite, as well stone fruit as other; and how they are afterwards to be ordered in packing, carrying, and conveighing them by land or by water; then in separating or culling them into divers sorts; and lastly, in reseruing or laying them up, so, as may be for their best lasting and continuance. . . . No Treatise, to this purpose, being heretofore published. 4to. London, 1604.

apple trees are set and planted in orchards made for that purpose; they delight to grow in good and fertile ground. Kent doth abound with apples of most sorts."

The cultivation of fruit land upon farms in many parts of Kent has always been an important feature in its agriculture, and of much benefit to its agriculturists. Boys remarked in 1796 that "Fruit orchards in Kent are considered most valuable estates"; and Marshall states that "The metropolis has long been supplied with orchard fruit from this county." He adds: "Upon the whole the practice of Kent may be safely recommended as the fittest subject of study which the Island at present affords with respect to the management of orchard grounds." Upon many farms where the conditions are favourable, especially in East and Mid Kent, there is a considerable acreage of fruit land attached to each farm, planted with cherry, apple, pear, plum, and damson trees, and with bush fruits, or soft fruits as they are sometimes called, gooseberries, currants, raspberries, either with or without standard trees, and strawberries, and filberts and cob nuts in Mid Kent. This acreage has largely increased, and will no doubt continue to increase, as, on the whole, fruit-growing has been profitable, and has materially benefited those fortunate enough to have fruit land on their farms. There are also cultivators who grow nothing but fruit. These are principally in the district of East Kent, between Rochester and Canterbury, and in the district of Mid Kent near London, and they manage their fruit land, as a rule, better than farmers, as they give their undivided attention to it and have more technical knowledge. But there has been great improvement of late in the management of fruit land, especially of cherry and apple orchards, the grass of which is fed off by animals having corn or cake, or the land is well manured. Apple trees are grease-banded and sprayed systematically by advanced fruit-growers, to prevent or check the onslaughts of destructive insects. Far more attention is being paid to the selection of varieties of apples and pears having colour, size, flavour, keeping qualities, and other attributes to meet the tastes of the public, and to compete with the beautiful fruit that comes from America and Canada.

In the following list are included the names of various kinds of fruit now planted in Kent:—Mr. Gladstone, Beauty of Bath, Devonshire Quarrenden, Lady Sudely, Yellow Ingestre, Worcester Pearmain. These are dessert apples coming to pick in August and September, and not stored. For storing, King of the Pippins, Cox's Orange Pippin (the best dessert apple in existence), Cox's Pomona, Duchess, Favourite, Gascoyne's Scarlet Seedling, Court Pendu Plat, Baumann's Red Reinette, Allington

Pippin, Duke of Devonshire, Blenheim Orange. Among kitchen apples for selling straight from the trees the most usually planted are Lord Grosvenor, Lord Suffield, Keswick Codlin, Early Julian, Eclinville Seedling, Pott's Seedling, Early Rivers, Grenadier, Golden Spire, Stirling Castle, Domino. For storing, the cooking sorts favoured now are Stone's or Loddington, Warner's King, Wellington, Lord Derby, Queen Caroline, Tower of Glamis, Winter Queening, Lucombe's Seedling, Bismarck, Bramley's Seedling, Golden Noble, Lane's Prince Albert. Almost all these will flourish equally as standards, pyramids, and bushes. Among pears are Hessle, Clapp's Favourite, William's Bon Chrétien, Beurré de Capiaumont, Fertility, Beurré Riche, Chissel, Beurré Clairgeau, Louise Bonne of Jersey, Doyenne du Comice, and Vicar of Winkfield. Among plums, Rivers' Early Prolific, Czar, Belgian Purple, Black Diamond, Belgian Purple, Kentish Bush Plum, Pond's Seedling, Magnum Bonum, and Victoria are mainly cultivated. The damson known as Farleigh Prolific, or Crittenden's, is most extensively grown in all parts of the county, and usually yields large crops, which make good prices. As an example of this contractors were offering to contract for quantities of this damson at 20*l.* per ton in May of this year, as the prospects of the yield were unsatisfactory. In one year recently, when the crop was abnormally abundant, some of the fruit barely paid the expenses of sending to market. The varieties of cherries most frequently grown are Governor Wood, Knight's Early Black, Frogmore Blackheart, Black Eagle, Waterloo, Amberheart, Bigarreau, Napoleon Bigarreau, and Turk. A variety of cherry known as the Kentish cherry, of a light red colour and fine subacid flavour, is much grown in Kent for drying and cooking purposes. Another cherry, similar in colour and quality, which comes rather later, known as the Flemish, is also extensively cultivated, as well as the very dark red large Morello, used for making cherry brandy. These three varieties are grown extensively as pyramids, and the last-named also on walls and sides of buildings. Sometimes the cherry crop is sold by auction to dealers who pick, pack, and consign the fruit to market. Large prices are often made, as much as 80*l.* per acre being not uncommon. The crop on a large cherry orchard in Mid Kent has been sold for more than 100*l.* per acre.

Attempts have been made by many to improve the condition of standard trees that have been long neglected and allowed to become overgrown by mosses and lichens, and to take away superfluous branches, but too often it is found that such old trees are past redemption. The introduction of bush fruit trees

dwarfed by grafting on the Paradise stock has been of much advantage to fruit cultivators in this country, as they come into bearing in two or three years, and are more easily cultivated, pruned, sprayed, and picked, than standards. Many plantations of these bush trees have been formed in Kent of apples, pears, and plums. Half standards and pyramids have also been planted of these fruits, as well as of cherries. Fruit bushes of gooseberries and currants, and raspberry canes have been planted to a great extent in many parts of the East and Mid divisions of Kent, but not much in the Weald, where apples are principally grown. Fruit bushes are put sometimes in alternate rows with bush trees of apple, pear, plum, and damson, or under standards, or they are planted by themselves.

The distances at which fruit trees are planted are generally from 30 feet by 30 feet for cherry trees and apples on grass; for standard apples and pear trees from 20 feet to 24 feet upon arable land, with bush fruit, as gooseberries and currants, under them. These are set 6 feet by 6 feet apart, and 5 feet by 2 feet for raspberries, and strawberries 2 feet 6 inches to 3 feet by 1 foot 6 inches to 1 foot 3 inches apart. On some fruit farms bush or dwarf trees—apples, pears, plums—are planted alone, at distances varying from 8 feet to 10 feet apart, giving from 485 to 680 bush trees per acre, nothing being grown between them except perhaps strawberries or vegetables during the first two or three years. It is believed that this is the best way of ensuring fruit of high quality and colour.

Another arrangement consists in putting standard apple or pear trees 30 feet apart (48 trees per acre), and setting bush trees of apples or pears 15 feet apart between them, which come quickly into bearing, and are removed when the standards are fully grown. Occasionally gooseberry or currant bushes, or raspberry canes or strawberry plants, are set between the bush trees, and taken away directly they interfere with their growth. Half standard apple or plum trees are set triangularly 15 feet apart, and strawberry plants at a distance of $1\frac{1}{2}$ feet from plant to plant, and $2\frac{1}{2}$ feet from row to row. Or currant and gooseberry bushes are set between the half standards, and strawberry plants between these.

These systems involve high farming. The manures used are London manure, where hops are not grown, and bone meal, superphosphate, rags, shoddy, wool-waste, fish refuse, nitrate of soda, kainit, and sulphate of ammonia. Where hops are grown the London manure is wanted for them. Fruit plantations are always dug by hand with the Kent spud. Fruit land is never ploughed, as in the United States and Canada.

The soil is levelled down with the "Canterbury" hoe (see fig. 7), and then the plantations are kept free from weeds with the ordinary or "plate" hoe. The best fruit farmers spray fruit trees regularly in the early spring, and continue until the blossoms come out, with quassia and soft soap and paraffin emulsions, and a very few with Paris green only, where there is no under fruit, in order to prevent and check the constant attacks of the various caterpillars and other insect pests which beset them. This is a costly and laborious process, but it pays well, as a rule. The fallacy that fruit trees on grass land require no manure, and that the grass may be allowed to grow up to their trunks without any harm, is exploding, and many fruit farmers are well manuring their grass orchards and removing the grass for some distance round the stems, particularly where the trees are young.

Strawberries are produced in enormous quantities in the northern part of the Mid Kent district round the Crays, and from thence to Orpington; also near Sandwich, and to some extent near Maidstone. Raspberry canes have been extensively put in during the last few years, and in some seasons yield good profits. There is a very great and growing demand for all soft fruits for jam-making, and prices are fairly good, taking an average of years, notwithstanding the heavy importations from France, Belgium, Holland, Spain, and Italy.

The extraordinary increase in the national demand for jam and other fruit preserves has been of vast benefit to Kent fruit producers. The cheapness of duty-free sugar, as compared with sugar paying duty in the United States and other large fruit-producing countries, affords one of the very few advantages possessed by British cultivators. Though fruit is sent in quantities from most countries, it does not pay to send jam to this country, and so far, at least, the British jam manufacturers have a practical monopoly. Jam factories were established in several parts of Kent about ten years ago, but most of them collapsed either from want of capital or from bad management. There are still a few remaining, principally in connection with large fruit farms. One of these is at Swanley, whose energetic owners farm nearly 2,000 acres of fruit land in Kent. The fruit grown by them that will not make satisfactory prices in a fresh raw state is made into jam, or if time presses it is first made into pulp, and kept until the opportunity comes for making it into jam. Fruit is also bought for jam-making, and citron peel is largely made here. There is another flourishing factory near Sittingbourne worked on the same lines. It is very advantageous to fruit farmers to have jam factories in connection with their farms, or to have them near,

as they can perfectly grade their fruit, and send only the best to market, thus ensuring a high reputation for its quality. Carriage is saved, which is a serious charge, though railway rates from Kent to the great manufacturing towns and to Scotland are very much less proportionally than those to London, and consequently Kent growers send increasing quantities to these distant markets, where prices are better, not being so directly interfered with by imported fruit, which generally finds its way to London. The local railway rates for fruit carriage in Kent are not unreasonable on the whole, especially when a bulk of fruit is consigned, and recently exceptional facilities like those given by the Great Eastern Railway Company have been offered by the amalgamated Kent railway companies, which should be of material value, particularly to small growers.

Kentish fruit-growers are becoming more particular in picking, grading, packing, and storing fruit, as well as in marketing it. A good deal more fruit is now carefully stored, and sent to selected markets as it ripens, or when there is an ascertained demand, as it is found that if it is consigned to market direct from the trees there must frequently be forced sales and competition with foreign fruit that is fully matured and in good order. It was customary formerly for Kentish growers to consign all their fruit to the London markets; now a good deal of it is sent to Manchester, Birmingham, Liverpool, Sheffield, Newcastle, and other large cities. Some is sent even to Edinburgh. Many large growers send no fruit to London now. It is by no means uncommon for growers to sell their fruit crops on the trees or bushes by auction or private treaty, or to contract to supply a stipulated quantity of particular fruit, say of currants, raspberries, or strawberries, to jam manufacturers. There is a considerable amount of fruit, such as grapes, peaches, nectarines, grown under glass in various parts of the county, and this kind of culture tends to increase.

Nuts.—Filberts and cob-nuts are a special product of Kent, in the neighbourhood of Maidstone principally, and upon the soil there alluded to before as "Coomb," as well as other Ragstone soils in this locality; but certain conditions of soil and situation are essential for their profitable production. A part of the filbert and cob-nut crop is picked green in September, as they do well for dessert, though their kernels are not large or firm, and it pays to sell them green, as they weigh more heavily. One grower in Mid Kent has 100 acres of nuts and has grown 100 tons in a good year. The average price of late years has been about 5*d.* per lb., which would make the gross return of the 100 acres amount to 4,660*l.* Kentish filberts have been

long proverbial for their excellence. Cobs are larger and look better for dessert, though their flavour is not so good. They are better croppers, and are now usually planted. This cultivation is not much extending, as it is very long before the trees come into full bearing. The London market is supplied entirely with these nuts from Kent, and there is some demand in America for them. Phillips, writing in 1822, states that "there are more filberts growing in Kent than in all England, besides there being several hundred acres in the vicinity of Maidstone."[1] Filbert and cob trees are most closely pruned. All the year's growth is cut away except the very finest young

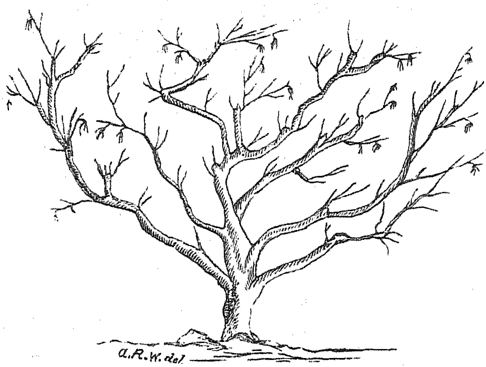


FIG. 10.—Nut Tree, showing method of Pruning.

wood, which the trained eye of the tree-cutter sees at a glance is blossom-bearing. The trees are kept from $5\frac{1}{2}$ to 7 feet high upon stems from $1\frac{1}{2}$ to 2 feet high, and are trained so as to form a cup of from 7 to 8 feet in diameter. Fig. 10 accurately represents their appearance. Though the trees look naked and forlorn in winter, the "pendants," or male blossoms, catkins, or "gull" (*Kentice*) have a pretty appearance at this season. Phillips rhymes of it:

E'en winter oft has seen it gay
With fretted fruit-work spangled o'er,
While pendants drooped from every spray,
And crimson budlets told once more
That spring would all its arms restore [2]

The pruning of filbert and cob trees requires skill and technical knowledge, which is often handed down from father to son in the villages near Maidstone, though in these later times it is complained that it is difficult to get expert cutters, notwithstanding that from 3*s.* 6*d.* to 4*s.* 6*d.* per day can be

[1] *The Companion for the Orchard*, by H. Phillips, F.H.S., 1822. [2] *Ibid.*

earned by this light labour. A well-known authority on fruit cultivation observes: "It is remarkable that this branch of the pruner's art should have been brought to perfection by the untaught, unlettered peasant." He goes on to say that "a reader would not be so wise during his whole life (especially as respects the pruning) as a visit to Maidstone would make him in an hour."[1] Without doubt many of the visitors to Maidstone during the recent Show will have seen the celebrated filbert plantations in the neighbourhood.

There seems no reason to expect any decrease in the acreage of fruit land in Kent. It has been steadily increasing latterly, and will increase more, and if the improvement in the selection of varieties and in the general management continues and advances, it will yet pay. A hundred years ago everyone was grubbing fruit land in order that hops might be planted, and for this many acres of splendid cherry orchards were sacrificed. Now the disposition is to grub hop plants and plant cherry trees.

WOODLANDS, HEDGES, FENCES.

The woodlands in most regions of Kent are better cared for than in some other counties, in consequence of the demand for hop-poles. The woods have been kept filled up with kinds of plants suited to the soil and situation, and best adapted for the hop-planters' purposes. In the more low lying and better soils ash and chestnut have been planted to fill up blanks, and chestnut, beech, birch, maple, alder, oak, and hornbeam upon high, poor land. Marshall says, "In the management of coppice woods the yeomen of Kent excel. The vacant spaces are assiduously filled up at every fall; 40*l.* per acre for ten years' growth, I was well assured, has been made."[2] Plantations of ash and chestnut have been made upon good soils and carefully looked after. Plantations of larch fir have also been formed here and there, as the poles are valued by hop-growers on account of their duration. There are, however, still many acres where the owners have neglected to fill up places where the stubs, or stocks, have died, either by putting in fresh plants or by "layering," or leaving a stout pole on a stub and bending it down and fastening it to the ground where stubs or plants have died, at two or three places, from which points of contact with the earth shoots appear the next spring and eventually form stubs. This is frequently done in Kentish woods, but it must be done with great care, and the points of contact with the earth well covered with sods, or the layer will not grow. Landowners occasionally put in

[1] *The Fruit Cultivator*, by J. Rogers.
[2] Marshall's *Rural Economy of the Southern Countie*

chestnut plants 6 feet apart each way, and larch firs between them 2 feet apart each way. Many of the larch firs come to cut in nine or ten years, and all are cleared off in seventeen or eighteen years, when the chestnut plants want all the air and space.

In 1796 Mr. Boys stated that the most material part of the produce of woods and plantations was the immense quantity of hop-poles cut for the hop plantations. He goes on to say that "the improvement made in the woods and an increased demand for hop-poles make some woodlands the most valuable estates in the county, as near Maidstone 50*l.* per acre was made of some wood of eleven years' growth on a poor pinnocky soil, and 104*l.* per acre of a fall of only nine years' growth of a plantation of chestnut, which is the most valuable of any sort for hop-poles." Buckland in 1845 speaks of woodland on an estate in the Weald of Kent, which thirty years before was not worth a rent of 5*s.* per acre, as worth 40*l.* to 45*l.* per acre for every fall of ten years' growth. In 1877 falls of the best plantations of ash and chestnut, occurring every eighth or ninth year, brought from 40*l.* to 60*l.* per acre. But the value of these and of the falls of all woodland has greatly decreased on account of the fall in the price of hops and the decrease in the hop acreage, together, in some degree, with the lessened demand for poles caused by the practice of creosoting all the poles and by the system now of permanent poling. The average price of ordinary woodland in hop districts is hardly more than 12*l.* 10*s.* per acre, and that of plantation land about 30*l.*

On account of the demand for stout poles for wire and string work the woodland is not cut so early now by at least two years. Most landowners keep the woodland and wood plantations in their own hands, and sell the falls by auction annually in the autumn. The falls are in many cases bought by "wood-buyers," who cut them themselves, or get them cut, and dispose of the poles, and "use pieces," for making sheep gates and for fencing, and the faggots, bavins, pea and bean sticks, hoopwood, stakes and binders, thatching and hurdle wood. Some of these wood-buyers make this their business, and get a good living out of it. They cut the wood in the winter, sell the poles and other produce, and work up the remainder, or make sheep-gates and hurdles during the spring and summer. The poles are cut 12 feet, 14 feet, and 16 feet long for ordinary poling. 10-foot or 11-foot poles are cut for young hops or for hops on land where the plant does not grow much bine, as in parts of East Kent, where the plants will not take long poles with stout butts. For wire-work the poles are cut from 18 to 22 feet long, with a diameter at the bottom of 6 to 8 inches, and make from 20*s.* to 27*s.* per 100.

Some allusion may suitably be made here to the admirable "Quick" hedges in parts of Kent, notably in Mid Kent. The soil is well suited for the growth of the Whitethorn or "Quick," *Cratægus oxyacantha*, and great pains are bestowed upon the hedges made of this plant. They are "brushed," that is, cut with a brushing hook, twice a year, and the ground near their stems is dug and hoed to prevent weed growth. Some hedges are from 18 to 25 feet high, and a foot and a half or two feet thick, serving as "lews" for hop and fruit plantations, and as fences through which neither man nor beast can penetrate. "Yet," as Marshall says—for they were a noteworthy feature of Kent farming when he visited Kent in 1798—"they occupy little more space of ground than a wall would require."

The fences on the best managed estates and farms are fairly well maintained in most parts of the county, but not so well in the Weald, where they are often rough, untrimmed, and allowed to spread far and wide. Good stake and binder fences are found here and there in the "hill country" of East and Mid Kent. Sheep gates are much more used for folding sheep than hurdles. These are made of split "use pieces," too large or too rough for hop poles, and are 7 feet long, made of five slats about 8 inches apart, roughly morticed into uprights 5 feet high, whose ends are sharpened to go into the ground. There are three braces to keep the slats firm; one upright brace in the centre, and one fastened obliquely on either side of the central brace. Holes are made with a pitcher to receive the pointed ends. Rows of poplars are frequently planted round hop grounds and fruit plantations, to "lew" them or shelter them from the wind. The variety of poplar is the Black Poplar or Italian Poplar, *Populus nigra*, and the trees, set 4 to 5 feet apart, afford very good shelter.

POULTRY-FARMING.

Kent seems to have been famous for poultry for some centuries, as in the account of Kent in Collier's Dictionary it is said: "Certain it is that this county breeds as large cattel and poultry as any part of England;" and again, "Hedcorn," a village in the Weald of Kent, "famed for capons." [1] Hasted writes, the "poultry of Kent of every sort are large and fine." [2] In Boys' *General View of the Agriculture of Kent*

[1] *The Great Historical, Geographical, Genealogical, and Practical Dictionary*, being a curious Miscellany of Sacred and Prophane History, by Jer. Collier, M.A., 1688.

[2] Hasted's *History of Kent*, vol. i., 1797.

it is stated that "Geese, turkeys, fowls, and ducks are bred in this country sufficient to supply the inhabitants, and a few to spare for the supply of the shipping from Gravesend and the Downs. The price of poultry is very much increased. Turkeys now sell as high as 6*s.* or 7*s.*, geese 4*s.* or 6*s.*, ducks and fowls 4*s.* to 6*s.* per couple." Arthur Young considered "the climate and soil of Kent both agree with poultry," and cites a farmer "who rears and sells 140 turkeys per annum, getting 5*s.* per head for them."

During the prosperous times of agriculture up to 1879 not much attention was paid by farmers to poultry rearing commercially, and comparatively few were bred for market. But in the last few years, when it has been important to exhaust every possible source of profit, all kinds of poultry have been reared There are not many poultry farms; some that were started in imitation of the Sussex industries of this nature were not successful. But the industry has been principally developed by farmers in connection with their business, requiring therefore comparatively little outlay for houses, runs, and food. There are many farmers in various parts of the county, especially in the Weald and in Romney Marsh, who have undertaken the business on a somewhat large scale, and have found it profitable. Some of them breed and fatten chickens and ducks. More, however, merely breed them, and sell them when from ten to twelve weeks old to agents for poultry fattening companies in Sussex, and other places, at prices between 2*s.* 4*d.* and 3*s.* 4*d.* each for fattening. Very early spring chickens bring higher prices occasionally, for the demand is great, and generally much beyond the supply, and there is ample room for the extensive increase of this industry. An instance of success may be cited in the case of one farmer, who has a run of forty to fifty hens of the Buff Orpington breed, who sold 260 chickens, hatched at the end of January, for 3*s.* apiece in the second week of April. Buff Orpingtons are extensively kept, as they are liked by the crammers. At this price rearing for other persons to fatten is considered by Kent poultry breeders as the best course to adopt, and it is extending somewhat rapidly. There seem at present no signs of any falling-off in the large inquiry for young chickens for fatting, though it is difficult to see where the profit from this process comes in.

Parishes in the Weald of Kent, as Benenden, Goudhurst, Headcorn, Marden, Cranbrook and Biddenden, furnish many examples of successful poultry keeping. Individual farmers here breed as many as 1,000 chickens annually, and, as a good authority holds, some of the finest produced in England.

There are also energetic poultry breeders at Edenbridge, Ashford, Wye, and in the Isle of Thanet. Ducklings are bred to some extent in parts of the county, and geese in the meadows of the Weald and the poorer pastures of the Marsh district.

SUSSEX CATTLE.

This breed originated in Sussex, and has been adopted by breeders and graziers in the bordering county of Kent, at least in its southern and south-eastern districts, where it does remarkably well, especially in the pastures of Romney Marsh and in the meadows of the Weald. It is a hardy breed of large size, fattening rapidly and producing meat generally acceptable to butchers. The milking qualities of the Sussex cows are not remarkable, though in this respect there has recently been some improvement. Marshall holds that it is one of the purest branches of the native or ancient stock of the island, and agrees in almost every essential character with the present breeds of Devonshire and Herefordshire. But in East Sussex, Sussex cattle were of a larger type than those in the more western districts of the county, and in the adjacent parts of Kent. In the early periods Sussex cattle were principally bred and maintained for draught purposes, and were consequently high standing, rather leggy, and gaunt, as shown in the illustration (fig. 11) of a bull that belonged to Arthur Young, which he probably purchased, on his journey in search of animals of this breed, and for which, together with a cow and a two-year-old heifer, he gave fifty-seven guineas.

Some of the working oxen were enormous creatures, as, for example, the famous ox bred at Burton Park, near Petworth, at the end of the last century, which was 16½ hands in height, and the length 8 feet from the beginning of the tail to the back of the horns, with a girth behind the shoulder of 10 feet, and a weight of 287 stone 4 lb. The present writer remembers having seen seven-year-old oxen of this kind fifty years ago, which came from a Sussex yoke to be fattened in Kent, not perhaps so high or so large as the Burton ox, but yet more huge than any oxen ever seen before or since, not exactly symmetrical, but having an admirable frame for piling meat upon.

In North Devon also a somewhat similar breed was found, not so large as the West Sussex breed, but larger and coarser than the cattle in South Devon, and bred with regard to working properties. When oxen ceased to be used as workers, and the production of meat was the sole requirement, the working types of West Sussex were crossed with the less coarse meat-making types

of the Pevensey Marshes and the adjacent districts, and by careful selection and management the present Sussex animal was evolved. In the same way the two Devon types have been amalgamated into the characteristic Devons, familiar in the Showyards of the Royal Agricultural Society of the present day. The Sussex cattle have improved immensely during the last thirty years. They formerly "handled" somewhat indifferently, the skin being thick, but in the best bred Sussex animals the handling now is as mellow as that of Devons and Herefords. Buckland, writing in 1845, says:—

> Sufficient pains and attention had not been generally bestowed on the breeding of this variety of stock; where that has been done very superior animals have been reared, and with moderate keeping and feeding they have

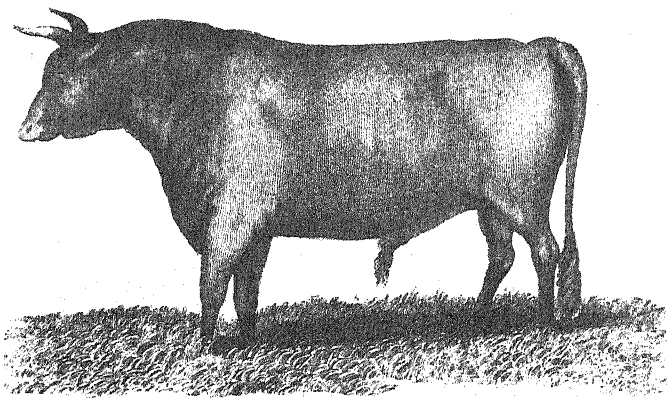


FIG. 11.—A Sussex Bull in the possession of Arthur Young, Esq., 1790.

> evinced a tendency to early growth and maturity, together with an improved symmetry of form.

This has now been achieved, and without recourse to any fusion with other breeds, though it is sometimes said that breeders have crossed the Sussex with Devons.[1]

Improvement is continuous in this breed, which is highly popular in Kent. Arthur Young had a high opinion of Sussex cattle, and wrote:

> The true cow has a deep red colour, the hair fine and the skin mellow, thin and soft; a small head, a fine horn, thin, clear and transparent, which should run out horizontally and afterwards turn up at the tips; the neck very thin and clean made, and straight top and bottom, with round and springing ribs, thick chine; loin, hips and rump wide; shoulder flat, legs

[1] Mr. Heasman, a noted Sussex breeder, wrote in the *Field* in 1872 that "great pains and attention have been taken lately in endeavouring to alter the style and type by breeding from the smallest bone with the greatest amount of flesh."

rather short, carcass large; the tail should be level with the rump, a ridged backbone.[1]

It has been suggested that Arthur Young described in the above glowing terms a Sussex animal as he considered it should be, and not as it actually was at the time he wrote, and there is no doubt that his description applies equally to the Sussex herds of the best breeders of the present day. But Mr. Ellman of Glynde, the celebrated breeder of Southdown sheep, described the typical Sussex animal in very similar terms. Figures 12 and 13 represent a bull called *Gondolier* and a heifer named *Flo*, both the property of Mr. Forster, of Rumwood, Maidstone. These animals have both been successfully shown.

Sussex cattle have sold quite as well lately as other breeds, and a higher price was given for a bull of this breed in 1898 than for a bull of any other breed except Shorthorn and Aberdeen Angus. The Shorthorn bull made 215*l.* 5*s.*; the Aberdeen Angus 75*l.* 12*s.*; and the Sussex 73*l.* 10*s.* The highest prices for Sussex cows in 1898 were 54*l.* 12*s.* and 52*l.* 10*s.*, and for yearling heifers 47*l.* 5*s.* At one sale of 47 head in 1898 the average price realised was 32*l.* 5*s.* 7*d.*, and at another sale 21 lots averaged 30*l.* 8*s.* In August of this present year, 1899, at the late Mr. F. Warde's sale, a two-year old heifer made 84 guineas, and a cow 65 guineas, whose bull calf fetched 35 guineas. Two cows at this sale brought 50 and 54 guineas respectively.

The Sussex breed lays on fat well, and comes to early maturity. Arthur Young gives an account, in his *Annals of Agriculture*, of an experiment in fattening Sussex cattle, showing that twelve Sussex beasts paid 67*l.* 17*s.* 11*d.* in sixteen weeks and two days and 4*l.* 10*s.* per week and 7*s.* 1*d.* per head per week, "which is certainly a noble produce, and such as a comparison with the beasts of other breeds that have been registered in this work makes every grazier anxious to produce a sort of cattle that pays so much for a small quantity of food." Looking through the records of the weights of the different breeds at the Show of the Smithfield Club in 1898, it is found that the 10 Sussex steers not above two years old averaged 12 cwt. 2 qrs. 2 lb., while 10 Shorthorn steers of the same age averaged 12 cwt. 3 qrs. 22 lb.; 6 Hereford steers averaged 12 cwt. 1 qr. 18 lb.; 10 Aberdeen Angus steers in the same class averaged 12 cwt. 6 lb. In the class for heifers not above three years old the average weight of the four Sussex animals exhibited was 13 cwt. 3 qrs. 21 lb. Four Shorthorn heifers averaged

[1] *Annals of Agriculture*, 1795, by Arthur Young, Esq.

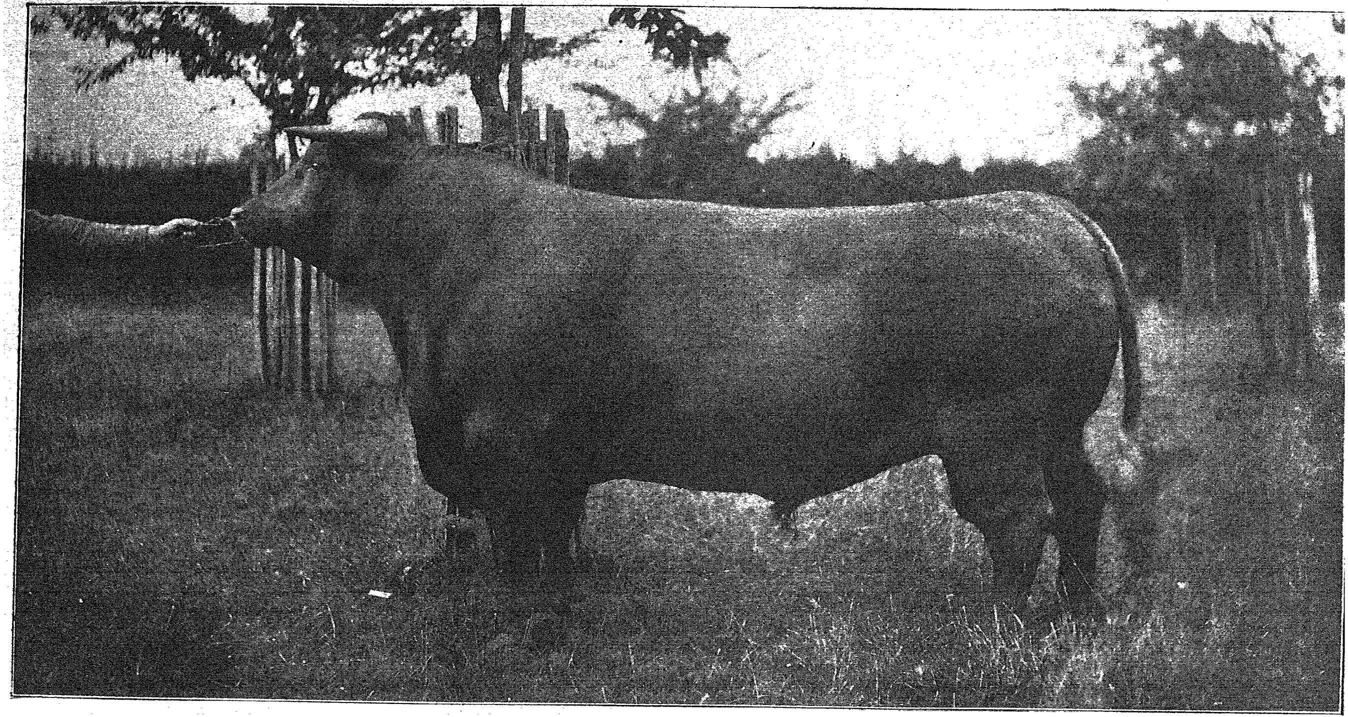


FIG. 12.—Sussex Bull, *Gondolier*.

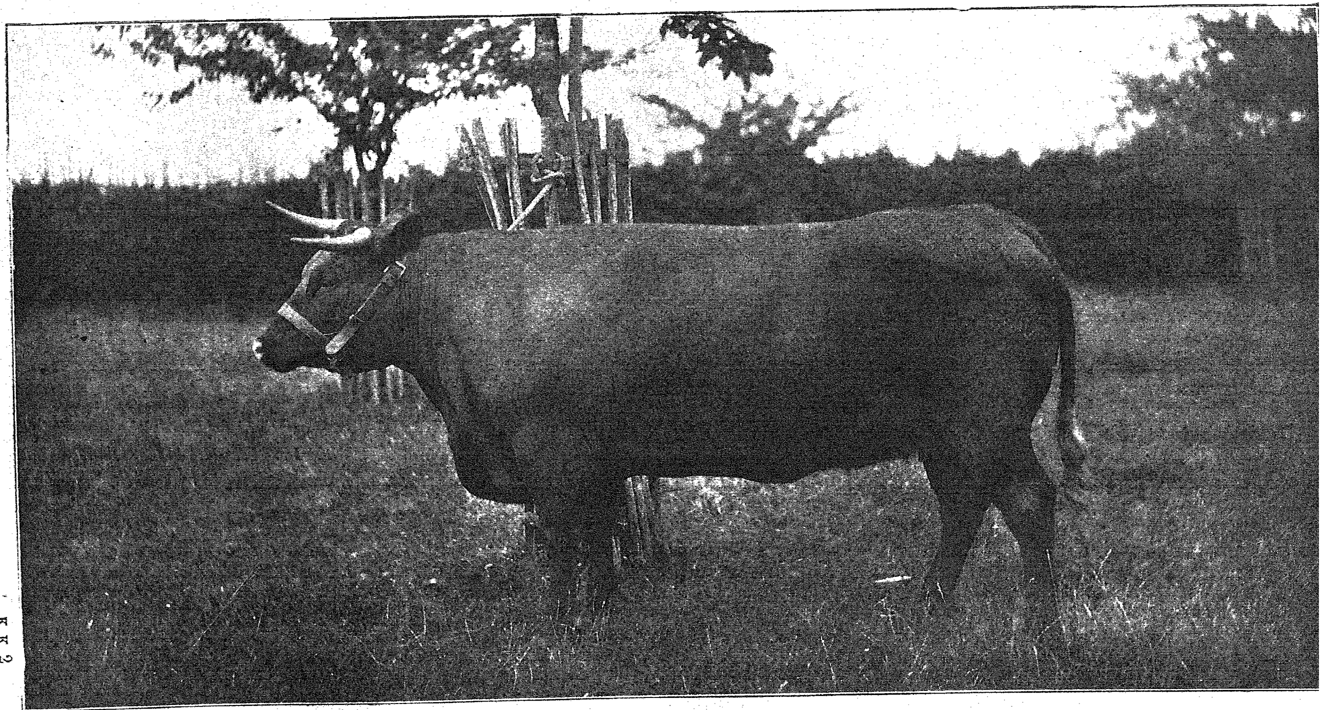


FIG. 13.—Sussex Cow, *Flo*.

14 cwt. 22 lb. Four Hereford heifers averaged 12 cwt. 2 qrs. 10 lb., and the average weight of eight Aberdeen Angus heifers was 14 cwt. 11 lb.

There are many breeders of Sussex cattle in Kent, not less than thirty-three breeders in the county having animals registered in the *Sussex Herd Book*. Among these, Major Best, Mr. Forster, the late Mr. F. Warde, Mr. Gerald Warde, Mr. White, and the Hon. R. P. Nevill have frequently carried off prizes at the Shows of the Royal Agricultural Society, the Bath and West of England Society, and the Smithfield Club.

This breed is much appreciated in America. A correspondent writes that he imported into Tennessee from Kent, in 1884, *General Roberts* (500), a well-known prize-winner in England, and ten heifers; also *Royal Surrey* (720) and *Portsmouth* (773), likewise prize takers, and *Ruddygore* (47) in 1889. In spite of the depression in cattle-breeding, the Sussex breed has won approval, and its introduction has proved an unqualified success. It has taken its full share of prizes and esteem in public competitions, and "has ever stood the crucial test of yielding a reasonable return over the cost of production. . . . The domiciliation of the Sussex in this country is an accomplished fact, and in Tennessee, his peculiar *habitat*, he is doing his full share in the improvement of the native cattle."

At the Show of the Tunbridge Wells Agricultural Society in 1898 there were no less than 65 entries of Sussex cattle.

Kent or Romney Marsh Sheep.

The Kent or Romney Marsh sheep is a breed peculiar to Kent, and is found in every section of the county, as there is no other breed that is so well adapted for most parts of it, especially its extensive marshes and marsh pastures. Upon the wide-spreading Romney Marsh no other breed would thrive, exposed to the chilling blasts from the east.

Boys says:

> Kent has long been famous for a fine breed of sheep called Romney Marsh sheep, but in Smithfield, where great numbers are sold every week, the sheep are known as Kent sheep. They are remarkable for arriving at an extraordinary degree of fatness at an early age, and for producing a large fleece of very fine wool. These circumstances combined render this perhaps the most valuable of any breed in the kingdom, not excepting the famous Dishley sort, whose wool confessedly is very coarse. Their carcasses and legs are rather long, and their bone large in comparison with some other breeds; they have no horns and their faces and legs are white.[1]

It has been suggested that the aboriginal Kent sheep posed as the model of the cube upon four legs representing sheep

[1] Boys, *General View of the Agriculture of Kent*, 1796.

in toy Noah's arks, and as toy manufacture has long been peculiar to the Low Countries, perhaps this breed, like hops, fruit and other good things, was "fetched out of Flanders." It is said that this breed was crossed with Leicesters towards the end of the last century, in order to improve the wool and to shorten the legs and length of the sheep; but this is repudiated by breeders, who hold that the pure-bred characteristic Kent always has been the best animal, especially for the marshes. It is likewise alleged that some graziers have crossed Kents with Lincolns, but this is also repudiated. At least all ram breeders deny that they have introduced Lincolns or any other breed into their flocks. Arthur Young, in several parts of his *Annals of Agriculture*, speaks of the Romney Marsh sheep, and of the graziers' opinion that they are well suited for marsh grazing, and he quotes a proposition at a dinner at Sir Edward Knatchbull's, Mersham Hatch, Kent,

> that the Kentish breeders are so clear in their superiority of their breed over the Leicestershires that they will make any Leicestershire breeder a bet of 500*l*. that 50 Kentish ewes tupped by a Kentish ram shall be compared with 50 Leicester ewes tupped by a Leicester ram, both to be fed in Romney Marsh, the lambs from weaning till sent to Smithfield at two years old, to be fed in two adjoining fields of equal size and value, that lot to be pronounced best which produces most money.[1]

The great improvement in this breed was made by judicious selection, and crossing the typical Romney Marsh sheep with Kent sheep, bred and fed "on the hill," whose characteristics slightly differed, inasmuch as the latter were more compact in frame and their wool was not quite so long. At one time there was a distinctive difference between Hill Kents and Romney Marsh sheep, but these have been now merged in one type possessing the best points of each variety. The "legginess" has been modified materially, the shoulder of mutton is better developed, and the wool has a dense and good staple. The form and character of this improved Kent are shown by the illustrations of the ram and ewe tegs (figs. 14 and 15) from photographs kindly sent me by Mr. A. Amos, of Spring Grove, Wye.

Kent sheep always feed singly; on being put into a pasture they immediately disperse over it and feed it down evenly and thoroughly, whereas Downs and sheep of other breeds feed in groups and make bare paths in all directions by their "follow the leader" habits. For this reason Kents are peculiarly adapted for feeding pasture and marsh pasture land. The mutton of Kent sheep is well flavoured, and is appreciated in spite of the joints being somewhat large. Buckland, writing of the Isle of Sheppey, where Kents were bred and fed as at this

[1] *Annals of Agriculture*, by Arthur Young, Esq., F.R.S., vol. xx. p. 268.

day, says, "Sheppey has been famed from time immemorial for its breed of sheep and the exquisite flavour of its mutton, and the epicure of the present day feasts on a Sheppey haunch with the same satisfaction as his Saxon forefathers.[1] A great deal of this mutton is consumed at Ramsgate, Margate, Broadstairs, Folkestone, and other seaside towns which are crowded during the summer. The verdict of large butchers in these towns, some of whom kill 100 sheep a week, is that it is emphatically good mutton, better than Hampshire Down mutton, and "the best of white-faced mutton," and has not such a large proportion of fat to the lean. This breed fattens

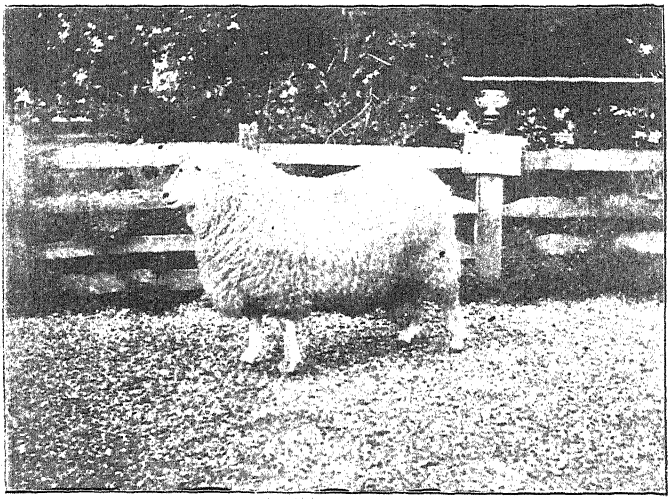


FIG. 14.—A Kent Ram.

well, and comes to early maturity. At the Smithfield Club Shows it holds its own among other breeds in respect of weight according to age. At the Smithfield Club Show in 1898, the average weight of 11 pens of three Kent wethers above 12 months and under 24 months old was 6 cwt. 3 qrs. 16 lb. The average of the Leicesters of the same age was 6 cwt. 3 qrs. 8 lb.; of Cotswolds, 6 cwt. 3 qrs. 9 lb.; Oxford Downs, 6 cwt. 2 qrs. 11 lb. The pens of three Kent lambs under 12 months averaged 3 cwt. 3 qrs. 15 lb.[2] The Leicesters averaged 4 cwt. 11 lb., and Cotswolds 3 cwt. 3 qrs. 23 lb. The average of Oxford Down lambs was 3 cwt. 3 qrs. 3 lb.

[1] Buckland, *Farming of Kent*, 1845.
[2] In 1895–6 the average of pens of Kent lambs was slightly over 4 cwt.

This breed also yields a good weight of wool. In some of the best flocks the average weight of the wool of the ewe flock is 7 lb. to 9 lb. per head; of ewe tegs, 7 lb.; of fat tegs, 8 lb.; of ram tegs, from 10 to 12 lb. per head; of old rams, from 12 to 16 lb. and even more, according to the time they are shorn. The wool of the Kents has been much improved of late. Its staple has been reduced in length and made shorter, with more fineness and density, which are the qualities required nowadays by manufacturers, and which are being cultivated by foreign wool producers.

FIG. 15.—Kent Ewe Tegs.

High prices are made by sheep of this breed, which are in great favour for exporting to New Zealand, Argentina, and other countries. Thus Mr. Godwin of Hadlow sold six ewe tegs to go to New Zealand a year or two since for 100*l*. He also sold a ram, *Hazle 15th*, for 20*l*. for New Zealand. This ram has well upheld the reputation of the Kent sheep in New Zealand, and carried off first prizes at agricultural shows at Christchurch, Dunedin, and Wellington; and a report from New Zealand states that he is a "grand sheep, of high quality and merit, and one that is full of the best characteristics of this breed, whose worth

and value are fully appreciated in this country." Mr. Godwin also made 40*l*. for another ram, and 65*l*. for two other rams for New Zealand, a few years back. But prices are not so good just now, as so many are breeding rams for the export trade. In 1898 the highest average price for Kent yearling rams was 12*l*. per head for 35, which does not compare by any means unfavourably with the prices made by other breeds. The highest price paid for a Kent ram in 1898 was 31*l*. 10*s*.; in 1897, 48*l*. 6*s*.; in 1896, 37*l*. 16*s*.

Dairy Farming and Technical Education.

Kent is by no means a dairy county. Herds of dairy cattle are kept in various parts, especially near London in the district between Gravesend and Bromley, and near the large seaside towns. In the Isle of Thanet there are several herds of very useful cows near Margate, Ramsgate, Broadstairs, and Westgate for supplying milk and cream to the visitors; also round Folkestone and Dover, Tunbridge Wells, and Sevenoaks. Comparatively little milk is sent to London. Butter is not a speciality of the county. It is not in high repute, either because the pastures are not well suited for butter-making, or, as some aver, because butter-making is not sufficiently well understood, so as to ensure a supply of butter of uniform quality. The low prices obtainable for butter also check butter-making, as not more than 1*s*. per pound can be obtained during the summer. The Technical Education Committee of the Kent County Council had a travelling dairy for some time, which was useful in some degree, but it was not fully appreciated nor well attended by the class who might have derived benefit from its work. This has been discontinued. Demonstrations in dairy work are occasionally given at agricultural shows at Ashford, Canterbury, Margate, and other places. There has been a resident dairy school at the South Eastern Agricultural College, at Wye, Kent, supported by the Kent and Surrey County Councils, for teaching persons wishing to acquire knowledge of dairying; this has been closed of late. There are, however, classes for the permanent students. This college is doing good work for Kent agriculture by educating the sons of its farmers in practical and scientific agriculture at a reasonable charge; also by experiments in hop and fruit culture, the growth of malting barley, and other investigations made at the college, and in centres in the county, on poultry rearing and bee keeping, and by lectures on hops, manures, and other subjects. There is a farriery school connected with this college, which goes from place to place, and is useful and popular. At Maidstone there are no less than 56 pupils on the books. Professor J.

Wortley Axe, of the Royal Veterinary College, has lectured for this school.

The Kent Technical Education Committee has established courses of lectures on hop-growing, horticulture, fruit culture, bees (which are extensively kept in Kent), and poultry-rearing throughout the county. Lectures on the last-named subject have been eminently successful and useful. The lecturer reported in 1898: "At almost every centre I find better samples of eggs and poultry." Very important experiments have been made in the last two seasons with regard to cold storage as applicable to the preservation of fruit and vegetables, so that in periods when certain fruit and vegetables are too abundant maturity may be suspended until there is a better demand for these. The opinion of a well-known fruit salesman is that "with proper refrigerating facilities, English fruit might almost drive foreign produce out of the market. . . . If there were adequate cold storage, one-third more English fruit could be sold at 25 per cent more money." The results so far have been encouraging, and have demonstrated that this scheme is feasible, but to be perfectly successful it must be carried out on a large scale, on the same lines as jam-making in factories.

Conclusion.

It must be said in conclusion that this is a mere sketch of the Agriculture of Kent, and the writer does not pretend to have done more than give a slight outline of its unusually numerous ramifications. There is probably no county in the kingdom in which there are so many different kinds of crops and industries in connection with the cultivation of land, concerning which many pages could be written. Some of them may be classified as "minor industries," as they are often called in somewhat derisive terms, but they are of the greatest importance to Kentish cultivators, without which they would have been in an almost hopeless state of depression. These "minor industries," for the production of luxuries or—as some of them have almost become—necessary additions to the comforts of life at the end of the nineteenth century, will be further developed as the wealth of the country and the prosperity of all classes increase, and many of the Kent cultivators are availing themselves skilfully and energetically of the opportunities which their soil, climate, and traditions offer.

Charles Whitehead.

Barming House, Maidstone.

THE MAIDSTONE MEETING, 1899.

ONLY once previously in the course of its sixty years' history has the Royal Agricultural Society held its Country Meeting in the fair county of Kent. That, however, was nearly forty years ago. During the time between the Society's twenty-second Annual Show at Canterbury in 1860 and its sixtieth Annual Show at Maidstone in 1899 more than a generation has passed away, whilst agriculture has undergone changes of a profound character. The decision of the Council to visit Maidstone was arrived at so long ago as February 3, 1897, and in the ordinary course of events the Meeting would have taken place in the county town of Kent in June, 1898. Unfortunately in the autumn of 1897 Maidstone was visited by a severe typhoid epidemic, in consequence of which it was deemed expedient not to hold the Show there in 1898. The Council, therefore, on December 8, 1897, accepted a cordial invitation from the city of Birmingham, where the Country Meeting of 1898 was held in due course, the visit to Maidstone being postponed for one year. Thus it happened that the Maidstone Meeting, which normally would have been held in 1898 under the presidency of the Earl Spencer, really took place in 1899, under the presidency of the Earl of Coventry. An incident such as this is unique in the annals of the Society. It is true that in 1866 the Meeting arranged to be held at Bury St. Edmunds that year was postponed to the same place in the following year. But in 1866 there was no Show at all, its suspension being due to the disastrous outbreak of cattle plague in this country.

It may be of interest to furnish, as in the subjoined table, a few details concerning the two Meetings that have taken place in the county of Kent at the wide interval of thirty-nine years :—

Year	Place of Meeting	President	Entries of Live Stock	Number of Implements entered	Persons paying for Admission
1860	Canterbury	Lord Walsingham	891	3,947	42,304
1899	Maidstone	Earl of Coventry	1,885	4,231	68,576

THE SHOW GROUND.

A more admirable site for a Showyard could not have been desired than that which was placed at the disposal of the Society

in Mote Park. It was not only easily accessible, the entrance gates being within a mile of both of the railway stations at Maidstone, but the position was historic, inasmuch as it was the place where King George III. reviewed the Kentish Volunteers exactly a century previously, an incident to which reference was happily made by Lord Spencer at the General Meeting (see Appendix, p. xc.). As will be apparent from the plan at p. 500, the visitor, on passing the turnstiles, had a variety of paths open to him whereby he could reach the centre of the yard. The ground sloped slightly upwards to the broad transverse avenue extending in front of the pavilions. The view from here, and still more from the grand stand at the far side of the great ring, was magnificent, and the eye rested contentedly alike on the charming woodland scenery close at hand and on the majestic amphitheatre formed by the Kentish hills in the distance.

Entries.

The entries at Maidstone and—for comparison—at the nine preceding Shows are set forth in the accompanying table. Of the live stock the cattle will better bear comparison than any other section with the corresponding totals of previous years. The space applied for in the Implement Yard was below the average. If, however, the comparison be made with the last previous Meeting held south of the Thames—that at Plymouth in 1890—it will be seen that, with the exception of pigs and poultry, the Maidstone entries were more numerous throughout, both in the stock and in the implement departments.

Number of Entries at the last Ten Country Meetings (1890–99).

Number of Animals or Pens entered	Maidstone, 1899	Birmingham, 1898	Manchester, 1897	Leicester, 1896	Darlington, 1895	Cambridge, 1894	Chester, 1893	Warwick, 1892	Doncaster, 1891	Plymouth, 1890
Horses	424	709	981	594	650	617	509	447	713	328
Cattle	683	792	821	594	548	659	758	605	661	642
Sheep[1]	631	624	701	551	505	588	631	610	643	571
Pigs	147	198	185	144	—	—	161	202	204	223
Total	1,885	2,323	2,688	1,883	1,703	1,864	2,059	1,864	2,221	1,764
Poultry	669	964	867	901	769	705	836	836	800	695
Produce	625	635	715	574	476	538	957	423	425	456

[1] Including 52 entries of goats in 1897, 14 in 1892, and 37 in 1889.

Number of Entries at the last Ten Country Meetings (1890-99).—*cont.*

Shedding in Implement Yard (in feet) [exclusive of open-ground space]	Maidstone, 1899	Birmingham, 1898	Manchester, 1897	Leicester, 1896	Darlington, 1895	Cambridge, 1894	Chester, 1893	Warwick, 1892	Doncaster, 1891	Plymouth, 1890
	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
Ordinary	7,455	9,350	9,320	8,506	7,528	8,435	8,610	8,241	8,343	6,117
Machinery in motion	2,192	3,239	3,334	2,732	2,718	2,539	2,211	2,151	2,106	1,291
Special Shedding (including seeds, models, &c.)	2,553	2,902	2,878	2,692	2,351	2,428	2,197	2,119	2,024	1,670
TOTAL	12,200	15,491	15,532	13,930	12,597	13,402	13,018	12,511	12,473	9,078
No. of Implement Stands	395	502	489	450	393	442	408	411	421	307

1860 AND 1899—A COMPARISON.

The totals of entries at the two Kent Meetings are shown in the table below. After so long an interval there is naturally a wide disparity between the sets of figures for the two years. Horses are seen to have been nearly four times as numerous, and cattle more than twice as many, at Maidstone as at Canterbury. Sheep also show a large increase, but the difference in numbers is less marked in the case of pigs. No provision was made for poultry in 1860, whilst the number of implement stands in the Canterbury Showyard barely exceeded half the total at Maidstone.

Comparison of Entries at the Two Kent Meetings,
1899 *and* 1860.

Section	Maidstone, 1899	Canterbury, 1860	Increase in 1899
	No.	No.	No.
Horses	424	112	312
Cattle	683	289	394
Sheep	631	371	260
Pigs	147	119	28
Poultry	669	—	669
Produce	625	49	576
Implement stands	395	212	183

A fuller comparison of the entries at the two Kent Meetings is rendered possible by means of the table on page 489.

COMPARATIVE STATEMENT OF ENTRIES, &c.,
AT THE TWO MEETINGS HELD AT CANTERBURY IN 1860 AND AT MAIDSTONE IN 1899.

IMPLEMENTS	1860 (July 9-12)	1899 (June 17-23)
Stands	212	395
Exhibits	3,944	4,231
Prizes offered	*£477*	*£140*

HORSES, CATTLE	1860 Classes	1860 Entries	1899 Classes	1899 Entries
HORSES:—				
Prizes	—	*£370*	—	*£1,835*
Hunters	2	16	11	50
Cleveland Bays & Coach Horses	—	—	4	19
Hackneys	1	2	8	55
Ponies	2	8	4	20
Shetland Ponies	—	—	2	21
Mountain, &c., Ponies	—	—	2	11
Polo Ponies	—	—	8	47
Harness Horses	—	—	3	34
Shire	Included under	Agricultural	7	90
Clydesdale	and	Dray	7	27
Suffolk			6	42
Agricultural	4	71	2	8
Dray Horses	4	15	—	—
Total for HORSES	13	112	64	424
CATTLE:—				
Prizes	—	*£905*	—	*£1,770*
Shorthorn	7	155	7	128
Hereford	7	44	7	57
Devon	7	40	6	35
Sussex	7	27	7	68
Longhorn	—	—	2	9
Welsh	—	—	5	18
Red Polled	—	—	5	33
Aberdeen Angus	—	—	5	46
Galloway	—	—	5	15
Ayrshire	—	—	5	13
Jersey	—	—	5	143
Guernsey	—	—	5	67
Kerry	—	—	2	11
Dexter	—	—	2	16
Dairy Cattle	—	—	3	24
Other establd. Breeds	5	23	—	—
Total for CATTLE	33	289	71	683

SHEEP, PIGS, POULTRY, PRODUCE	1860 Classes	1860 Entries	1899 Classes	1899 Entries
SHEEP:—				
Prizes	—	*£570*	—	*£1,410*
Leicester	3	60	5	30
Cotswold, &c.	3	64	5	21
Lincoln	—	—	6	61
Oxford Down	—	—	5	31
Shropshire	3	68	5	103
Southdown	3	76	6	114
Hampshire Down,	3	72	5	66
Suffolk, &c.			5	44
Border Leicester	—	—	3	24
Kentish	5	31	6	86
Wensleydale	—	—	2	12
Devon Long Woolled	—	—	2	11
Somerset and Dorset	—	—	2	4
Cheviot	—	—	2	8
Black Faced Mountain	—	—	2	9
Herdwick	—	—	2	2
Welsh Mountain	—	—	2	5
Total for SHEEP	20	371	65	631
PIGS:—				
Prizes	—	*£180*	—	*£360*
Large White, &c.	3	41	4	43
Middle „ (*See Other*	*Breeds*)	—	4	22
Small „	3	37	4	12
Berkshire	—	—	4	49
Tamworths	—	—	4	21
Small Black	3	22	—	—
Other Breed	3	19	—	—
Total for PIGS	12	119	20	147
TOTAL FOR STOCK	Classes **78**	Entries **891**	Classes **220**	Entries **1,885**
POULTRY:—				
Prizes	—	—	—	*£268 10s.*
Entries	—	—	96	669
PRODUCE:—				
Prizes	—	*£90*	—	*£539*
Entries	7	49	50	625

Grand Totals for LIVE STOCK, POULTRY, and PRODUCE				
	1860	**85 Classes**	**940 Entries**	**£2,115 Prizes**
	1899	*366* „	*3,179* „	*£6,354*[1] „

[1] Including £32 offered for Horse-Shoeing Prizes.

The total entries of live stock, poultry, and produce, numbering 3,179, in 1899 were more than three times the corresponding total of 940 in 1860. The prize-money offered in connection with these classes this year was 6,354*l.*, or fully three times as much as the 2,115*l.* similarly offered in 1860. The Horse section is seen to have been entirely re-modelled since 1860. In the Canterbury Catalogue the only breeds of Cattle specifically recognised were the Shorthorn, Hereford, Devon, and Sussex. Sheep were represented by not more than half-a-dozen classified breeds, and it is interesting to recall that it was at about this time that the Shropshires won for themselves separate classification.

In the Implement Department in 1860 special trials took place of steam ploughs, threshing machines, and reaping machines, and prizes were awarded in each class. Prizes were also given for root-pulpers, root-cutters and slicers, chaff-cutters, linseed and corn-crushers, and bone and bone-dust mills. At this year's Meeting the implement trials were for cream separators (see p. 525), and for machines for washing hops (see p. 545). In the Miscellaneous Section four Silver Medals were awarded for appliances which are described in the Report at p. 552. A prize of 20*l.* was offered for a machine for the evaporation of fruit and vegetables, but there was no entry. A prize of 5*l.* was offered for packages for the carriage of soft fruit; there were three entries, but the Judges pronounced them of "no merit." A prize of 5*l.* was also offered for packages for the carriage of hard fruit, for which again there were three entries, but the Judges reported "no entries suitable for commercial purposes."

The Show.

The Implement Yard alone, including the Dairy, was open to the public on Saturday, June 17. Miss F. Coward commenced at the Dairy a series of demonstrations, which were continued on each day of the Show; they included butter-making, potting butter for winter use, fancy cheese-making and cream cheese-making. The judging of the produce classes—butter and cheese, cider and perry, and hops—and also of the poultry classes, took place on this day.

Divine service was held on Sunday morning in the large tent on the Show ground, and was attended by herdsmen, shepherds, and others engaged with live stock, besides many members of Council. The service, as usual, was choral, and the sermon was preached by the Bishop of Dover (the Right Rev.

William Walsh, D.D.), who took as his text Amos iii. 3: "Can two walk together, except they be agreed?"

On Monday, June 19, at 8.30 A.M., the Stewards and the Judges of live stock assembled in the large tent, where they were briefly addressed for the first time by Mr. Percy Crutchley, in his new capacity of Honorary Director of the Show. Judging forthwith commenced in the various stock rings and elsewhere, and was brought to a close in all sections in the course of the day. On this and each succeeding day lectures on housing and feeding poultry, and demonstrations of the dressing and trussing of poultry, were given in a special shed by Mr. Edward Brown. Demonstrations of bee-driving and lectures on bee management were also begun, and were repeated daily.

Tuesday was a specially interesting day. The Prince of Wales, President-elect of the Royal Agricultural Society, arrived on the Show ground at noon, having travelled from London to Maidstone by special train that morning. His Royal Highness was accompanied by Prince Serge Galitzine and the Earl of Coventry, President of the Society, and was received by the Honorary Director and the Council. The customary General Meeting of Governors and Members of the Society was held in the large tent, and a report of the proceedings appears in the Appendix (p. lxxxix). A noteworthy incident of the gathering was the cordial greeting given to the foreign agriculturists, whose welcome visit is referred to more at length below. In the great ring a morning parade of cattle and heavy horses took place, followed by an afternoon parade of hunters, hackneys, and other light horses; these parades were repeated on each subsequent day. On this and the remaining days the band of the Royal Engineers played selections of music, the programme of which was printed in the Catalogue.

On Thursday the Lord Mayor of London accompanied by the Sheriffs of the City visited the Show. The Honorary Director conducted the civic party through the principal sections of the Exhibition, after which they witnessed the afternoon parade of horses.

Visit of Foreign Agriculturists.

One of the most interesting features of the Meeting was the large influx from all parts of the Continent of foreign agriculturists, whose visit to the Exhibition gave rise to a number of pleasing international courtesies. The comparative proximity of Maidstone to the French coast suggested to the

authorities of the recently associated South-Eastern and Chatham and Dover Railway Companies the idea of organising visits of foreign agriculturists upon a considerable scale, and this idea was ably carried out by the executive of the Companies, acting in concert with the Continental railways and with the well-known tourist agents, Messrs. T. Cook & Son.

Whilst thus extending a cordial welcome to this large number of foreign agricultural excursionists, the Society had particular pleasure in receiving two important official delegations from the great national Agricultural Societies of France and Germany, both of which Societies were founded upon the model of the Royal Agricultural Society of England. The delegation from the French Society, the Société des Agriculteurs de France, consisted of the following distinguished members:—

Monsieur le MARQUIS DE VOGÜÉ, Président de la Société, Membre de l'Institut de France, Ancien Ambassadeur.
Le PRINCE VICTOR DE BROGLIE.
Monsieur le VICOMTE D'ARTOIS, Vice-Président de la section des relations internationales et coloniales, à Nortkerque.
Monsieur le VICOMTE ARTHUR DE CHEZELLES.
Monsieur L. DE CLERCQ, conseiller général du Pas-de-Calais, Président du Syndicat des Shorthorns Français.
Monsieur M. G. DUFAURE, Ancien Député, Membre du Conseil de la Société.
Monsieur G. GAUTIER, Secrétaire de la Section d'économie du bétail.
Monsieur E. MADARÉ, Président de la Société d'Agriculture de Boulogne-sur-Mer et du Syndicat agricole du Boulonnais.
Monsieur P. MERSIER, Secrétaire de la section d'économie du bétail.
Monsieur L. MILCENT, Membre du Conseil de la Société, Administrateur du Crédit agricole mutuel de Poligny.
Monsieur J. PLICHON, Député du Nord, Membre du Conseil de la Société.
Monsieur le COMTE DE SAINT-QUENTIN, Député du Calvados, Membre du Conseil de la Société, Membre de la Société Nationale d'Agriculture.
Monsieur HENRY L. DE VILMORIN, Membre du Conseil de la Société, Vice-Secrétaire de la Société Nationale d'Agriculture, Président de la Société Nationale d'Horticulture.[1]
Monsieur D'ARBOVAL, Secrétaire-adjoint du Conseil de la Société.

The delegation from the German Society, the Deutsche Landwirtschafts-Gesellschaft, consisted of Herr Berndt von Arnim, Chairman of the Directorate of the Society, Herr Berthold Wölbling, the Secretary of the Society, and Herr Schiller.

Both delegations were officially received on the morning of the Monday of the Show by the President, the Earl of Coventry, in front of the Royal Pavilion, where each member of the two delegations was introduced to his Lordship by the Marquis de Vogüé and Herr von Arnim respectively. During the morning Sir Walter Gilbey, Mr. E. W. Stanyforth, and

[1] Through the lamented death of Monsieur Henry L. de Vilmorin, which took place in August, the Royal Agricultural Society has to deplore the loss of one of its most distinguished Honorary Members.

other members of the Council conducted the delegates round the Stock Department of the Showyard and to the rings where the judging of the various classes of horses and cattle was in progress; and they were afterwards entertained at luncheon by the President.

On the following day, Tuesday, the principal members of the delegations were invited to be present on the platform at the General Meeting of the Society. His Royal Highness the Prince of Wales, in replying to the formal motion that he be requested to take the Chair as President after the conclusion of the Maidstone Meeting, took the opportunity of announcing that the Council had conferred the Honorary Membership of the Society upon the Marquis de Vogüé and Herr von Arnim. The presentation by His Royal Highness to these two distinguished representatives of French and German agriculture of their badges of Honorary Membership was evidently highly gratifying to the recipients, and their speeches of thanks, delivered in excellent English, were punctuated by hearty applause from all parts of the crowded tent.

After the General Meeting, the President of the Society gave a luncheon party in the Royal Pavilion in honour of the Prince of Wales. The two new Honorary Members sat, at the Prince's request, on either side of His Royal Highness. There were also present, Prince Serge Galitzine, Master of the Horse to the Czar of Russia; Monsieur de Clercq, Président du Syndicat des Shorthorns Français; the Lord Lieutenant of Kent, the High Sheriff of Kent, the Mayor of Maidstone, and other distinguished local personages, besides a number of members of the Society's Council.

Later in the day the members of the two foreign delegations were presented individually to H.R.H. the Prince of Wales, as well as the following members of the Société de l'Agriculture du Nord: M. Clément Coquelle (President), MM. Lepeuple and Auguste Potié (Vice-Presidents), and MM. Bondnel, Emile Davaine, and Desprey (ex-Presidents).

A very attractive feature of the day's proceedings was a selection of music given by La Grande Harmonie de Roubaix (an association of 120 musicians justly renowned in France), who kindly volunteered their services on the occasion of the visit of themselves and their compatriots to the Show. After luncheon, the Prince of Wales and the other members of the party sat under a tent to listen to some of the pieces that were played. At the conclusion of the programme, His Royal Highness sent for Monsieur Catteaux, the president of the band, and Monsieur Koszul, the conductor, and complimented them

highly on their performance. "God Save the Queen" was then admirably rendered by the band, and as a final piece they gave, at the vociferous request of the audience, "La Marseillaise," which was loudly applauded.

Although the Maidstone Meeting is one of the smallest that has been held by the Society for some years, the foreign agriculturists who visited the Show for the first time expressed great surprise at its magnitude and their admiration at the completeness of the arrangements.[1] In this connection it is worth incidental mention that it was a visit in 1860 to the previous Meeting of the Society held in Kent that inspired some German agriculturists to set up in their own country a National Agricultural Society on the model of that of England. The first year-book of the Deutsche Landwirtschafts-Gesellschaft, published in 1887, contains in the Introduction a history of the foundation and development of that Society, in which occurs the following paragraph:

> In July 1860 a number of German agriculturists visited the exhibition of the Royal Agricultural Society at Canterbury. They saw, with astonishment, what an influence the existence of a well-organised Show could have on the development of agriculture. They forthwith determined to invite the agriculturists of Germany to found a German Agricultural Society with the chief object of holding an annual show in different parts of Germany. A Society was accordingly founded on March 5, 1861, with 500 members, and in the next year (1862) it organised a cattle show at Leipzic. It took part in the Great Hamburg Exhibition of 1863, and in 1865 undertook an exhibition at Dresden, but this resulted in a deficit of about 530*l.*, which was made up by the Government of Saxony. This loss, coming at a time when the German political outlook was so unsettled, was the death blow of the Society, which made no further effort, though the intention of forming a German National Agricultural Society was never lost sight of. Several smaller efforts were afterwards made, but they mostly ended in disaster. At length, in 1882, Herr Max von Eyth returned to Germany from England, where for twenty-two years he had been associated with the firm of John Fowler & Co. of Leeds, and during that time had had ample opportunities of studying the working of the Royal Agricultural Society's Shows. He immediately commenced trying to make known the usefulness of the English Society, and, as a result of his writings and speeches, five gentlemen determined in February 1883 to form a German Agricultural Society. The Society came into actual existence in 1884, and was formally constituted on December 11, 1885.[2]

---

[1] An appreciative reference to the Show, as well as to the reception accorded to the French delegates, appears in the *Bulletin de la Société des Agriculteurs de France* for July 1, 1899 (Tome xlvi., pp. 6–7).

[2] The subsequent history of this now flourishing Society is well told in a book published this year in Berlin by its Secretary, Herr Wölbling, entitled *Der erste Rundgang der landwirtschaftlichen Wanderausstellungen in Deutschland.* 1887–1898. The Society had, according to its latest year-book, 12,142 members on October 1, 1898 and had already accumulated a capital or reserve fund of over 53,000*l.*

THE WEATHER.

With the exception of one day the weather throughout the Meeting was exceedingly favourable. The gates were opened under brilliant sunshine on the Saturday, which proved to be the hottest day of the Meeting, the afternoon temperature being much too high to be enjoyable. The sky was somewhat overcast on Sunday, and there were signs of impending rain, which fortunately fell in the night and was succeeded by delightful weather on the Monday, when the judging of live stock took place under conditions which could not have been improved. Save for a few drops of rain that fell on Tuesday afternoon, perfect summer weather continued to be enjoyed on Tuesday and Wednesday. The wet day of the Meeting was Thursday, when it rained with steady persistency throughout the morning and far into the afternoon, without, however, impairing to any serious extent the surface of the ground in the Showyard. The old conditions re-established themselves on Friday, and the Show closed on Midsummer Eve in beautiful weather.

THE ATTENDANCE.

The Table of Attendances given on p. 496 tells its disheartening story only too clearly. The aggregate attendance of paying visitors, numbering 68,576, was the lowest for 24 years. It is necessary to go back so far as the Taunton Meeting in 1875 to find a smaller total, the aggregate on that occasion being 47,768. Curiously enough, at the Taunton Meeting itself was recorded the smallest attendance for 15 years, as, by strange irony, it is necessary to refer back to the only former Kent Meeting—Canterbury in 1860—to find in the total of 42,304 a smaller number than that at Taunton. The two Kent Meetings of 1860 and 1899 together give an aggregate attendance of only 110,880, a total which has been exceeded at each of eight out of the twelve Shows held during the dozen years immediately preceding. The sparse attendance on the 5*s.* day (Monday) is seen to be without a parallel over the period embraced by the table. Again, the admissions on the two 2*s.* 6*d.* days together amount to only 17,500, a total that has been exceeded on at least one of the corresponding days at any of the half-dozen preceding Meetings. More than this, on the popular days, when a visitor could pass the turnstiles for a shilling, the number of people who disbursed this modest coin on the two days together did not exceed 49,843, a total that falls short of the number of visitors on one only of the shilling days at five of the eight preceding Meetings. At Manchester in 1897, at Leicester

in 1896, and almost at Cambridge in 1894, the visitors on a single day outnumbered those at Maidstone for the whole week.

Number of Paying Visitors at the last Ten Country Meetings (1890–99).

Day of Show	Maidstone, 1899	Birmingham, 1898	Manchester, 1897	Leicester, 1896	Darlington, 1895	Cambridge, 1894	Chester, 1893	Warwick, 1892	Doncaster, 1891	Plymouth, 1890
Implement day (2*s*.6*d*.)	183	256	—	172	574	260	299	266	344	194
1st day (5*s*.)	1,050	2,462	4,547	1,801	2,172	1,879	2,397	3,570	2,681	1,234
2nd day (2*s*. 6*d*.)	8,928	10,492	22,418	17,409	12,046	13,152	20,959	16,598	12,331	10,008
3rd day (2*s*. 6*d*.)	8,572	22,317	21,473	21,735	24,942	17,890	19,034	15,779	18,530	39,308 [1]
4th day (1*s*.)	35,249	49,011	73,119	80,602	43,073	63,981	59,555	36,448	57,580	32,371
5th day (1*s*.)	14,594	13,739	73,802	24,558	17,503	14,496	13,664	23,801	20,034	14,026
Total	68,576	98,277	217,980 [2]	146,277	100,310	111,658	115,908	96,462	111,500	97,141

[1] The third day was a 1*s*. day at Plymouth. [2] Including 22,621 on the sixth day (1*s*.).

As ten years have elapsed since the last publication in the Journal of a detailed statement of the takings day by day at the entrances, at the stands, and elsewhere, it may be interesting to continue up to date the Tables of receipts and admissions at the Society's Meetings since 1852 which have already appeared in the Volumes of the Journal for 1877 (years 1852 to 1877) and for 1889 (years 1878 to 1889).[1] The receipts for sales of tickets, produce, and catalogues, reported at the time of the Shows by the Stewards of Finance have been adjusted by the inclusion of certain incidental items received earlier or later than the Show week, in order that the figures may agree with those printed in the annual balance-sheets.

STATEMENT OF RECEIPTS AND ADMISSIONS
AT EACH OF THE SOCIETY'S COUNTRY MEETINGS
From 1890 *to* 1899 *inclusive*.

Dates of Admission	No. of Persons admitted	Price of Admission	Total Receipts from Admissions	Charge for Horse-ring	Receipts at Horse-ring	Receipts at Working-Dairy	Receipts from Sales of Catalogues
PLYMOUTH, 1890.							
			£ s. d.		£ s. d.	£ s. d.	£ s. d.
Saturday, June 21	194	2/6	22 5 9	—	—	—	—
Monday, June 23	1,234	5/	308 10 6	2/	33 14 0	2 8 0	90 10 0
Tuesday, June 24	10,008	2/6	1,252 13 9	2/	198 1 6	12 17 0	122 0 0
Wednesday, June 25	39,308	1/	1,970 12 11	1/	128 1 0	11 7 6	82 0 0
Thursday, June 26	32,371	1/	1,621 12 6	1/	100 11 0	5 5 0	45 18 0
Friday, June 27	14,026	1/	702 4 0	1/	41 8 0	1 17 0	24 10 0
Season Tickets	—	10/6	138 7 6	—	—	—	—
Sales of Produce	—	—	—	—	—	30 13 8	—
Sales of Catalogues	—	—	—	—	—	—	41 4 10
Total No. of Admissions	97,141	—	6,016 6 11	—	501 15 6	64 8 2	406 2 10

Grand Total of Receipts during Plymouth Meeting . . **£6,988 8*s*. 5*d*.**

[1] See Second Series of Journal, vol. xiii., pp. 584–7, and vol. xxv., pp. 482–7.

DONCASTER, 1891.

Dates of Admission	No. of Persons admitted	Price of Admission	Total Receipts from Admissions	Charge for Horse-ring	Receipts at Horse-ring	Receipts at Working-Dairy	Receipts from Sales of Catalogues
			£ s. d.		£ s. d.	£ s. d.	£ s. d.
Saturday, June 20 . .	344	2/6	41 5 0	—	—	—	14 14 0
Monday, June 22 . .	2,681	5/	667 15 0	2/	56 6 0	4 10 0	157 7 6
Tuesday, June 23 . .	12,331	2/6	1,541 11 9	2/	193 9 9	14 4 0	182 2 6
Wednesday, June 24 .	18,530	2/6	2,318 0 0	2/	243 10 0	17 17 0	150 2 6
Thursday, June 25 . .	57,580	1/	2,883 19 3	1/	138 14 0	12 12 0	230 16 6
Friday, June 26 . . .	20,034	1/	1,002 11 10	1/	65 16 0	1 8 0	24 17 3
Season Tickets . .	—	10/6	82 8 6	—	—	—	—
Sales of Produce . .	—	—	—	—	—	69 3 11	—
Sales of Catalogues .	—	—	—	—	—	—	44 19 8
Total No. of Admissions	111,500	—	8,537 11 4	—	697 15 0	119 14 11	804 19 11

Grand Total of Receipts during Doncaster Meeting . . **£10,160 1s. 2d.**

WARWICK, 1892.

Dates of Admission	No. of Persons admitted	Price of Admission	Total Receipts from Admissions	Charge for Horse-ring	Receipts at Horse-ring	Receipts at Working-Dairy	Receipts from Sales of Catalogues
Saturday, June 18 . .	266	2/6	23 10 0	—	—	—	11 0 0
Monday, June 20 . .	3,570	5/	891 9 1	2/	79 12 0	4 4 0	161 10 0
Tuesday, June 21 . .	16,598	2/6	2,070 11 4	2/	207 14 0	14 4 0	199 1 0
Wednesday, June 22 .	15,779	2/6	1,891 16 2	2/	143 6 0	11 14 0	123 0 0
Thursday, June 23 . .	36,448	1/	1,817 3 2	1/	77 10 6	5 4 6	108 0 0
Friday, June 24 . . .	23,801	1/	1,182 16 0	1/	52 18 6	5 3 6	47 4 6
Season Tickets . .	—	10/6	179 17 6	—	—	—	—
Day Tickets . . .	—	—	29 6 0	—	—	—	—
Sales of Produce . .	—	—	—	—	—	70 13 1	—
Sales of Catalogues .	—	—	—	—	—	—	80 2 11
Total No. of Admissions	96,462	—	8,086 9 3	—	561 1 0	111 3 1	729 18 5

Grand Total of Receipts during Warwick Meeting . . **£9,488 11s. 9d.**

CHESTER, 1893.

Dates of Admission	No. of Persons admitted	Price of Admission	Total Receipts from Admissions	Charge for Horse-ring	Receipts at Horse-ring	Receipts at Working-Dairy	Receipts from Sales of Catalogues
Saturday, June 17 . .	299	2/6	32 18 3	—	—	—	10 18 0
Monday, June 19 . .	2,397	5/	599 2 0	2/	48 18 0	4 1 0	177 0 0
Tuesday, June 20 . .	20,959	2/6	2,618 16 7	2/	275 6 0	11 9 0	280 8 0
Wednesday, June 21 .	19,034	2/6	2,378 13 3	2/	181 18 0	15 10 0	191 6 0
Thursday, June 22 . .	59,555	1/	2,833 16 4	1/	136 7 0	11 2 6	117 17 9
Friday, June 23 . . .	13,664	1/	669 12 5	1/	9 13 0	3 5 0	7 15 4
Season Tickets . .	—	10/6	270 7 0	—	—	—	—
Day Tickets . . .	—	—	190 5 0	—	—	—	—
Sales of Produce . .	—	—	—	—	—	93 0 11	—
Sales of Catalogues .	—	—	—	—	—	—	53 9 4
Total No. of Admissions	115,908	—	9,593 10 10	—	652 2 0	138 8 5	838 14 5

Grand Total of Receipts during Chester Meeting . . **£11,222 15s. 8d.**

CAMBRIDGE, 1894.

Dates of Admission	No. of Persons admitted	Price of Admission	Total Receipts from Admissions	Charge for Horse-ring	Receipts at Horse-ring	Receipts at Working-Dairy	Receipts from Sales of Catalogues
			£ s. d.		£ s. d.	£ s. d.	£ s. d.
Saturday, June 23 . .	260	2/6	29 15 6	—	—	14 6	10 0 0
Monday, June 25 . .	1,879	5/	403 10 0	2/	6 8 0	4 13 0	153 6 0
Tuesday, June 26 . .	13,152	2/6	1,598 15 5	2/	210 6 0	9 7 0	152 14 6
Wednesday, June 27 .	17,890	2/6	2,214 12 7	2/	186 14 0	8 18 0	116 15 0
Thursday, June 28 . .	63,981	1/	3,025 13 10	1/	130 19 6	8 7 6	104 5 0
Friday, June 29 . . .	14,496	1/	679 19 0	1/	24 19 0	2 4 6	40 9 6
Season Tickets . .	—	10/6	252 16 6	—	—	—	—
Day Tickets . . .	—	—	177 2 6	—	—	—	—
Sales of Produce . .	—	—	—	—	—	104 8 1	—
Sales of Catalogues .	—	—	—	—	—	—	64 15 0
Total No. of Admissions	111,658	—	8,382 5 4	—	559 6 6	138 12 7	642 5 0

Grand Total of Receipts during Cambridge Meeting . . **£9,722 9*s*. 5*d*.**

DARLINGTON, 1895.

Dates of Admission	No. of Persons admitted	Price of Admission	Total Receipts from Admissions	Charge for Horse-ring	Receipts at Horse-ring	Receipts at Working-Dairy	Receipts from Sales of Catalogues
Saturday, June 22 . .	574	2/6	69 0 6	—	—	—	15 16 0
Monday, June 24 . .	2,172	5/	543 19 6	2/	55 8 0	4 1 0	155 18 0
Tuesday, June 25 . .	12,046	2/6	1,500 6 3	2/	215 0 0	7 14 0	160 2 0
Wednesday, June 26 .	24,942	2/6	3,111 11 10	2/	288 4 0	15 19 0	145 4 6
Thursday, June 27 . .	43,073	1/0	2,123 8 9	1/	93 6 0	10 14 6	90 9 6
Friday, June 28 . . .	17,503	1/0	857 11 10	1/	34 4 0	2 15 0	48 16 0
Season Tickets . .	—	10/6	245 16 0	—	—	—	—
Day Tickets . . .	—	—	64 7 6	—	—	—	—
Sales of Produce . .	—	—	—	—	—	84 6 1	—
Poultry Stand . . .	—	—	—	—	—	5 15 0	—
Sales of Catalogues .	—	—	—	—	—	—	51 5 9
Total No. of Admissions	100,810	—	8,516 2 2	—	686 2 0	131 4 7	667 11 9

Grand Total of Receipts during Darlington Meeting . . **£10,001 0*s*. 6*d*.**

LEICESTER, 1896.

Dates of Admission	No. of Persons admitted	Price of Admission	Total Receipts from Admissions	Charge for Horse-ring	Receipts at Horse-ring	Receipts at Working-Dairy	Receipts from Sales of Catalogues
Saturday, June 20 . .	172	2/6	19 16 0	—	—	—	12 15 0
Monday, June 22 . .	1,801	5/	450 15 0	2/	16 10 0	2 0 0	154 11 0
Tuesday, June 23 . .	17,409	2/6	2,162 19 6	2/	233 0 6	5 10 0	178 19 6
Wednesday, June 24 .	21,735	2/6	2,705 13 2	2/	162 17 6	8 18 0	158 11 6
Thursday, June 25 . .	80,602	1/0	3,982 18 5	1/	117 13 0	7 12 0	124 10 0
Friday, June 26 . . .	24,558	1/0	1,223 2 11	1/	26 11 0	1 17 0	55 4 6
Season Tickets . .	—	10/6	312 0 0	—	—	—	—
Day Tickets . . .	—	—	73 11 3	—	—	—	—
Sales of Produce . .	—	—	—	—	—	97 1 0	—
Poultry Stand . . .	—	—	—	—	—	10 8 0	—
Sales of Catalogues .	—	—	—	—	—	—	52 5 0
Total No. of Admissions	146,277	—	10,930 16 3	—	556 12 0	133 6 0	736 16 6

Grand Total of Receipts during Leicester Meeting . . **£12,357 10*s*. 9*d*.**

MANCHESTER, 1897.

Dates of Admission	No. of Persons admitted	Price of Admission	Total Receipts from Admissions £ s. d.	Charge for Horse-ring	Receipts at Horse-ring £ s. d.	Receipts at Working-Dairy £ s. d.	Receipts from Sales of Catalogues £ s. d.
Wednesday, June 23	4,547	5/	1,105 12 0	2/	71 0 0	1 8 0	203 15 6
Thursday, June 24	22,418	2/6	2,803 19 4	2/	317 16 0	7 1 0	300 16 6
Friday, June 25	21,473	2/6	2,684 4 2	2/	253 3 6	7 2 0	207 18 6
Saturday, June 26	73,119	1/	3,587 1 9	1/	199 1 0	6 19 0	208 4 4
Monday, June 28	73,802	1/	3,663 15 2	1/	354 8 0	5 7 0	115 12 8
Tuesday, June 29	22,621	1/	1,120 6 7	1/	86 9 0	1 16 0	71 14 9
Season Tickets	—	10/6	363 4 0	—	—	—	—
Day Tickets	—	—	131 10 0	—	—	—	—
Sales of Produce	—	—	—	—	—	129 2 0	—
Poultry Stand	—	—	—	—	—	7 14 0	—
Sales of Catalogues	—	—	—	—	—	—	12 10 9
Total No. of Admissions	217,980	—	15,459 13 0	—	1,281 17 6	166 9 0	1,120 13 0

Grand Total of Receipts during Manchester Meeting . **£18,028 12*s*. 6*d*.**

BIRMINGHAM, 1898.

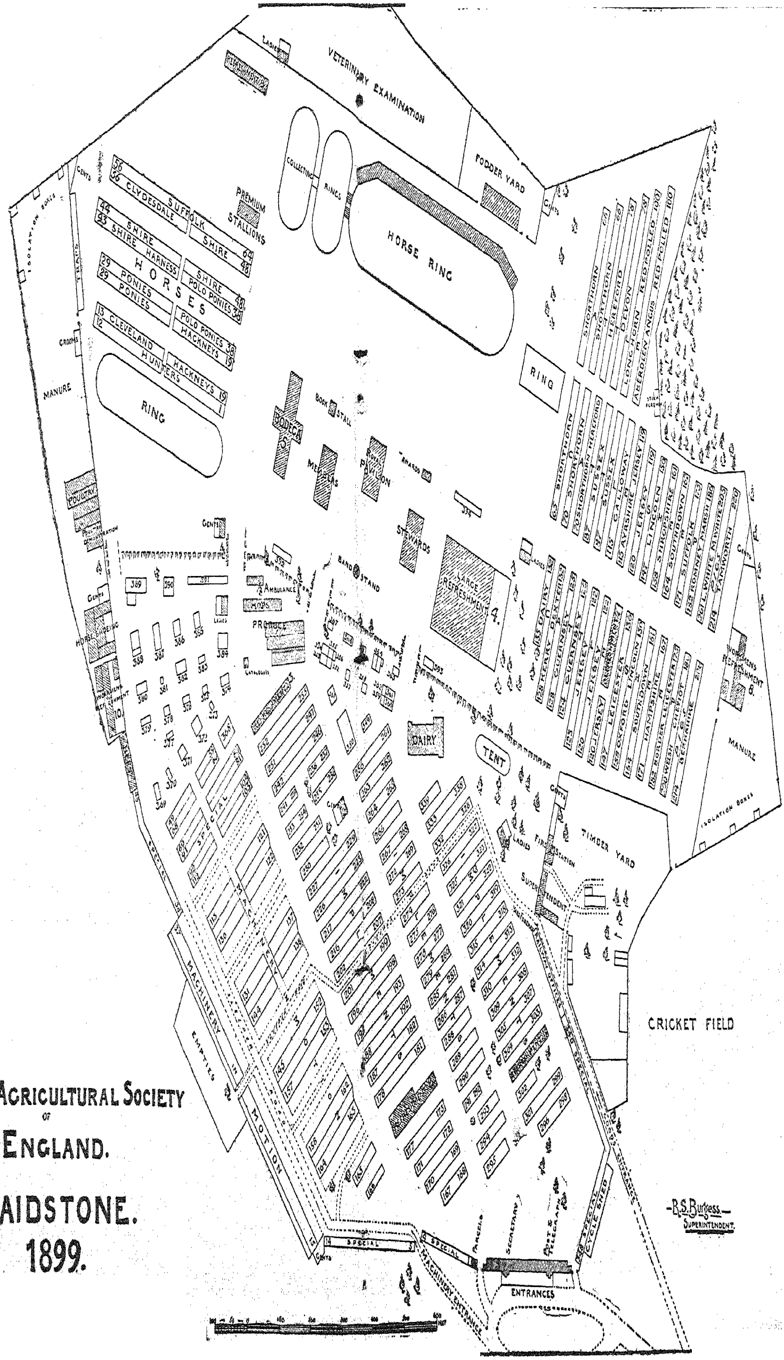
Dates of Admission	No. of Persons admitted	Price of Admission	Total Receipts from Admissions £ s. d.	Charge for Horse-ring	Receipts at Horse-ring £ s. d.	Receipts at Working-Dairy £ s. d.	Receipts from Sales of Catalogues £ s. d.
Saturday, June 18	256	2/6	31 17 3	—	—	—	—
Monday, June 20	2,462	5/	613 9 1	2/	19 2 0	3 5 0	172 5 3
Tuesday, June 21	10,492	2/6	1,311 19 7	2/	213 7 0	5 5 0	171 10 0
Wednesday, June 22	22,317	2/6	2,788 15 10	2/	349 6 6	5 8 0	164 14 0
Thursday, June 23	49,011	1/	2,445 14 2	1/	117 14 0	5 0 6	130 10 0
Friday, June 24	13,739	1/	686 19 0	1/	24 4 0	19 0	24 12 0
Season Tickets	—	10/6	157 9 6	—	—	—	—
Day Tickets	—	—	86 5 0	—	—	—	—
Sales of Produce	—	—	—	—	—	50 13 4	—
Poultry Stand	—	—	—	—	—	4 9 0	—
Sales of Catalogues	—	—	—	—	—	—	60 18 10
Total No. of Admissions	98,277	—	8,122 9 5	—	723 13 6	7 19 10	724 10 1

Grand Total of Receipts during Birmingham Meeting . **£9,645 12*s*. 10*d*.**

MAIDSTONE, 1899.

Dates of Admission	No. of Persons admitted	Price of Admission	Total Receipts from Admissions £ s. d.	Charge for Horse-ring	Receipts at Horse-ring £ s. d.	Receipts at Working-Dairy £ s. d.	Receipts from Sales of Catalogues £ s. d.
Saturday, June 17	183	2/6	22 2 6	—	—	—	—
Monday, June 19	1,050	5/	262 15 0	2/	24 11 0	—	105 6 6
Tuesday, June 20	8,928	2/6	1,117 11 0	2/	214 11 0	1 10 6	102 12 8
Wednesday, June 21	8,572	2/6	1,064 1 0	2/	101 4 0	2 12 0	62 5 0
Thursday, June 22	35,249	1/0	1,628 19 10	1/	113 9 0	5 4 6	45 5 0
Friday, June 23	14,594	1/0	640 1 3	1/	21 13 0	1 0 3	15 1 3
Season Tickets	—	10/6	96 13 6	—	—	—	—
Day Tickets	—	—	200 5 0	—	—	—	—
Sales of Produce	—	—	—	—	—	56 9 5	—
Poultry Stand	—	—	—	—	—	3 8 3	—
Sales of Catalogues	—	—	—	—	—	—	40 6 6
Total No. of Admissions	68,576	—	5,032 9 1	—	475 8 0	70 4 11	370 16 6

Grand Total of Receipts during Maidstone Meeting . **£5,948 18*s*. 6*d*.**



ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

MAIDSTONE. 1899.

The views of the Judges in the several sections of the Exhibition are quoted in, or incorporated with, the details which follow. The names of the Stewards and of the Judges, together with the full official List of Awards, will be found at p. xcv. of the Appendix. As this list supplies all essential particulars concerning the ownership, breeders, and parentage of the prize animals, it is unnecessary to repeat these in the text.

Horses.

The total entries of horses, numbering 424, were not only much under the average of recent years, but were the smallest since the Plymouth Meeting in 1890, the last preceding occasion when the Show was held south of the Thames. The largest aggregate was furnished by Shires, as may be seen in the Table herewith, Hackneys ranking next. The results of the veterinary inspection form the subject of a report, which will be found at p. lxxvi. of the Appendix.

Entries of Horses at the last Five Country Meetings, 1895–99.

—	Maidstone, 1899	Birmingham 1898	Manchester, 1897	Leicester, 1896	Darlington, 1895
Prizes offered	£1,835	£2,416	£3,588	£1,880	£2,012
	No.	No.	No.	No.	No.
Hunters	50	157	197	164	173
Cleveland Bays / Coach Horses	19	22 / 18	23 / 17	19	48 / 34
Hackneys	55	103	183	93	106
Ponies	20	42	79[1]	27	18
Mountain and Moorland Ponies	11	23[1]	—	—	—
Polo Ponies	47	69	95	—	—
Shetland Ponies	21	—	—	—	15
Pit Ponies	—	—	—	—	11
Harness Horses and Ponies	34	40	73	27	20
Shires	90	135	172	173	95
Clydesdales	27	34	51	27	70
Suffolks	42	39	44	28	34
Rulley Horses	—	—	—	—	5
Draught Horses / Agricultural Geldings	8	27	47	36	21
Total Entries of Horses	424	709	981	594	650

[1] Including Shetland Ponies.

Light Horses.

Hunters.—Eleven classes attracted a total of only 50 entries, and in no single class did the number of entries exceed seven.

Taking first the Heavy-weight Hunters in Classes 1, 3, 5, 6, and 7, two useful mares came back from the veterinary examination in Class 1, but the Judges "think it a pity that brood mares should be hogged, and tails cut so short." Class 3 was of very good quality, and in Class 5 again quality was prominent. Class 6 was the best, and was noteworthy for quality combined with strength; had the first prize colt "had his tail left on, it would have improved his value." Class 7 (three-year-old fillies) was the worst to enter the ring, a circumstance the more regrettable as the Judges consider it a very important class. As to the Light-weight Hunters (Classes 2, 4, and 8 to 11) the Judges report as follows:—

We consider the classes on the whole moderate both as to numbers and quality, if we except the yearling and two-year-old classes in the fillies, and the single year-old gelding. The riding class was poor in all respects.

We were glad to see in the majority of cases that the manes and tails of the horses had not been disfigured either by the manes being hogged or by the tails being docked too short.

Cleveland Bays and Coach Horses.—Nineteen entries were accommodated in four classes, the largest of which was Class 15, for fillies, with eight entries. The three-year-old stallions (Class 12) were a promising lot of three entries. The two-year-old stallions (Class 13) were a good lot, combining action, quality, and bone. The mares (Class 14) were excellent, as were the prize animals amongst the fillies (Class 15).

Hackneys.—These were represented by 55 entries, or less than half of the average number. Of the eight classes the best filled was that for two-year-old fillies (Class 20), which attracted twelve entries. The champion stallion was Mr. Harry Livesey's *McKinley*, and the champion mare the same exhibitor's *Orange Blossom.* Nineteen class prizes were awarded amongst the produce of 13 different sires. Of the latter, *Stow Gabriel* stands at the top with two first prizes to his credit, whilst *Agility* is represented by one first and two seconds, and *Garton Duke of Connaught* by one first and two thirds. Four sires figure in the list for one first prize each—*Connaught*, *Danger*, *Rosador*, and *Royal Danegelt.* One second and one third prize went to offspring of *Ganymede*, whilst *Clovelly*, *Langton*, *Royal Dane*, and *Yorkshire Post* have to their credit one second prize each, and *His Majesty* one third prize. Subjoined is the Judges' report:—

Class 16 (three-year-old stallions).—A good class, containing both the champion and the reserve. First and second prize horses very equal in merit.

Class 17 (two-year-old stallions).—Not a good class.

Class 18 (stallions foaled in 1898).—A fairly good class, nothing outstanding.

Class 19 (mares).—A good class on the whole, the second and third being very equal in merit.

Class 20 (two-year-old fillies).—Of not much merit.

Class 21 (yearling fillies).—Three good fillies, very difficult to place.

Class 22 (mare or gelding foaled in 1892, 1893, 1894, or 1895).—First prize animal an outstanding good one.

Class 23 (mare or gelding foaled in 1896).—Very good class.

Ponies.—Four classes attracted a total of 20 entries. Stallions (Class 24) were an inferior class, and mares (Class 25) were somewhat uneven.

Shetland Ponies.—Twenty-one entries were accommodated in two classes. Stallions (Class 28) were a fair class, several of the ponies possessing much merit. Mares (Class 29) made a very good class, with not a single bad pony in it.

Mountain and Moorland Ponies.—Two classes were provided, and the entries numbered 11. Only two stallions appeared in Class 30. The mares (Class 31) were a fair lot, "but there was great room for improvement."

Polo Ponies.—This section was first introduced at the Manchester Meeting in 1897, and was continued last year at Birmingham. At Maidstone there were 47 entries, distributed amongst eight classes. Class 32, stallions not over 14 hands 2 inches, furnished three very good animals. Class 33, Eastern ponies, the Judges considered hardly up to the mark. Class 34, stallions not over 13 hands 2 inches, comprised two animals, both exceedingly good, and so nearly equal in merit that much difficulty was felt in deciding which should be placed first; it subsequently transpired that they were half brothers, both by *Rosewater*. Class 35, mares above 13 hands 2 inches and not over 14 hands 2 inches, the Judges regarded as the most important class; it consisted of a number of very good animals, any of which should breed good Polo Ponies. Class 36, mares not over 13 hands 2 inches, was also a good class, but rather short in numbers. Class 37, colt, gelding, or filly, foaled in 1896, was likewise small. Class 38, colt, gelding, or filly, foaled in 1897, was the best in the section, except Class 39, colt, gelding, or filly, foaled in 1898, which was made up of even more beautiful animals. The Judges formed the opinion that these two classes (38 and 39) comprised animals which, if they come to maturity, are certain to make a valuable addition to the already much improved breed of Polo Ponies. They add:—

We beg to be allowed to congratulate the Society upon having had the best collection of ponies that has ever been brought together.

Harness Horses and Ponies.—Three classes were provided, and included 34 entries. In Class 40, mare or gelding above

15 hands, there were many absentees. Class 41, mare or gelding above 14 and not over 15 hands, was a good class of valuable horses. Class 42, pony, mare, or gelding not over 14 hands, was a level class of good ponies.

Thoroughbred Stallions.—The stallions which won the four Queen's Premiums of 150*l.*, awarded in 1899 by the Royal Commission on Horse Breeding in connection with District D—Berkshire, Cornwall, Devonshire, Dorset, Hampshire, Kent, Somerset, Surrey, Sussex, and Wiltshire—were exhibited, not for competition, in a special shed. They were *Chibiabos*, *Dry Toast*, *Grand National*, and *Just in Time*. See Appendix, p. xcix.

Heavy Horses.

Shires.—The entries, 90 in number, fell considerably below the average of recent years. They occupied seven classes, the largest of which was Class 49, yearling fillies, with 17 entries. The 21 class prizes which were awarded were distributed amongst the produce of 16 different sires. At the top of the list this year, as last year, is *Prince Harold*, with two first prizes and one second to his credit. *Bury Victor Chief* ranks next with one first and two seconds, and is followed by *Markeaton Royal Harold* with one first and one second. *Calwich Heirloom*, *The Colonel V.*, and *Marmion II.* are each represented by one first prize; *Wiseton*, *Royal William II.*, and *Paxton* each by one second prize; and *Harold's Pilot*, *Duncan III.*, *Yorkshire Lad V.*, *Hitchin Conqueror*, *Seldom Seen*, *Insurgent*, and *Harold* each by one third prize.

The Judges were sorry there were not more entries in several of the classes, and they add:—

> We notice with regret that many animals entered did not put in an appearance and come before us. At the same time it is a gratification to observe that many animals possessed great merit.

Clydesdales.—Though below the average the entries of this breed, numbering 27, were identical with those at the Meeting of 1896, held much further north, at Leicester. Of the seven classes the best filled was Class 53, for mares, but even that had only five entries. In their report the Judges say:—

> The Clydesdale exhibit, as a whole, was very limited in extent, doubtless owing to the great distance between Maidstone and those districts in which the breed is numerically strong. While few in numbers, however, most of the animals were excellent specimens of the breed, there being a marked absence of those inferior animals which, while increasing the number of entries, confer no other advantage on the Show, the spectators, or the owners.

Suffolks.—Forty-two entries were arranged in six classes, the largest being Class 60, for mares, which comprised nine entries. In the course of the report it is stated:—

The most important remark the Judges in this section put on record is the fact that of all the eighteen animals which they selected for prizes not a single specimen has been rejected as unsound by the veterinary inspectors. And they further add that of every animal brought into the ring, including reserved numbers, specimens commended, and those not deemed worthy of particular notice, only one was stated by the veterinary inspectors to be unsound. The Royal Agricultural Society, not less than the breeders and exhibitors of Suffolk horses, may be congratulated on their efforts to eradicate disease in their breeding stock.

As to the general character of the Suffolk horses, the Judges are satisfied that the county sent specimens to the Royal Society's Exhibition at Maidstone which, as regards soundness, uniformity of character, and general appearance, do the breed much credit. One and all of the classes show a greater development of muscle, more bone, and a freer action than the exhibits of twenty years ago displayed.

Whatever may be the verdict passed on the Suffolks exhibited at Maidstone by those who prefer heavier horses, the home breeders were abundantly satisfied with the animals sent from Suffolk.

Agricultural Horses.—Two classes were provided, but they were very poorly filled, there being only four entries in each, and the total of eight entries far below the average.

Cattle.

Jerseys were the most numerously represented breed of cattle with 143 entries, whilst Shorthorns were not far behind with 128. For third place the Sussex beat the Guernseys by one, the entries of these breeds being 68 and 67 respectively. The aggregate entry of Scotch breeds was 74, as against 99 in the preceding year. Details concerning other breeds are supplied in the table on the opposite page.

Shorthorns.—The 128 entries in this section were distributed amongst seven classes, the best filled of which was Class 71, yearling heifers, with 25 entries. Class 65, old bulls, furnished only four animals of considerable merit. Class 66, two-year-old bulls, contained two animals of much promise, but nothing else to call for special notice by the Judges. Class 67, yearling bulls, included some useful animals, amongst them the champion bull [Mr. J. Deane Willis's *Bapton Emperor*]. The cows (Class 68) made but a small class, in which "the prizes went to a considerable extent for the promise of dairy qualities." The three-year-old heifers (Class 69) made another small class, of quality below the average. Two-year-old heifers (Class 70), on the other hand, were a very excellent lot—"seven of them most excellent." Yearling heifers (Class 71) included some

very good animals, the three winners being fit for any show; this class contained the champion female [Her Majesty the Queen's *Cicely*]. The Judges add:—

The quality of the Shorthorns, taken as a whole, was below the average of a Royal Show.

Entries of Cattle at the last Five Country Meetings, 1895–99.

—	Maidstone, 1899	Birmingham, 1898	Manchester, 1897	Leicester, 1896	Darlington, 1895
PRIZES OFFERED	£1,770	£1,716	£2,105	£1,656	£1,740
	No.	No.	No.	No.	No.
Shorthorns	128	188	184	127	124
Herefords	57	60	60	47	50
Devons	35	38	51	26	28
Sussex	68	28	25	27	20
Longhorns	9	22	—	—	—
Welsh	18	21	32	23	8
Red Polled	33	27	38	28	22
Aberdeen Angus	46	56	46	31	60
Galloways	15	24	29	22	46
Highland	—	—	3	6	3
Ayrshires	13	19	21	7	14
Jerseys	143	158	149	130	91
Guernseys	67	79	61	46	32
Kerries	11	18	17	14	13
Dexters	16	22	27	17	14
Dairy Cattle	24	32	78	43	23
Total Entries of Cattle	683	792	821	594	548

Herefords.—The entries, 57 in number, were quite up to the average. Of the seven classes the largest was Class 74, yearling bulls, with 15 entries, amongst which were many animals that promised to make good sires. The Judges found the display fully up to the average in quality, and embracing a very representative lot of animals. With regard to the two-year-old heifers (Class 77) they say:—

In the class for heifers calved in 1897 we had no difficulty in awarding the first prize, but the second and third gave us some trouble in consequence of the great extent to which one of them had been overfed, which amounted in one case to disfigurement, and which practice in any exhibition of breeding stock ought to be denounced, though we admit it is a very hard matter to know where to draw the line.

The yearling heifers (Class 78) were perhaps the most attractive class in the Hereford section.

Devons.—Thirty-five entries were arranged in six classes, each containing from four to seven animals. The old bulls (Class 79) were a grand lot, and showed no less merit than

former years' exhibits. Young bulls (Class 80), although lacking character somewhat, were fairly good. Cows in milk (Class 81) were well represented, Three-year-old heifers (Class 82) made a good show, the prize animals having but few faults. Two-year-old heifers (Class 83) were somewhat wanting in character, especially with regard to their heads, but, on the whole, were a commendable class. Yearling heifers (Class 84) showed a falling off in general contour, as compared with the older ones. More attention, the Judges add, might well be paid to original types in breeding.

Sussex.—The locality of the Show accounted for the comparatively large display of this breed, the 68 entries being more than double the average of recent years. The best filled of the seven classes were those for yearling bulls (Class 87) and yearling heifers (Class 91), each with 14 entries. The former was a good class, and included several useful bulls, and the competition, as in the older bull classes, was very close. Three-year-old heifers (Class 89) were fewer than the cows (Class 88), but included much to be admired. Class 90, two-year-old heifers, furnished both the champion [the Earl of Derby's *Bangle*] and the reserve. Yearling heifers (Class 91) were generally good.

Longhorns.—This section, revived at the Birmingham Meeting last year, was continued, and there were nine entries—three of bulls (Class 92) and six of cows (Class 93). In the latter the Judges noticed a great improvement in flesh and quality.

Welsh.—Eighteen entries were very uniformly distributed over five classes. The quality was excellent throughout, and in the Judges' opinion the exhibits were all of special merit.

Red Polled.—There was about an average entry of 33 animals, and the largest of the five classes was Class 102, two-year-old heifers, with eight entries. They made "a very creditable display."

Aberdeen Angus.—The 46 entries of this breed constituted a full average exhibition in point of numbers. The yearling heifer class (Class 108), with 12 entries, was the best filled of the five classes. The Judges report that a better collection has seldom been seen in an English showyard.

Galloways.—With 15 entries this breed was somewhat below its average representation. Of five classes the largest was that for the younger bulls (Class 110), with four entries. The quality throughout was "extra good."

Ayrshires.—Thirteen entries were distributed over five classes, one of which (Class 114, old bulls) was vacant, and

the best filled was Class 116 (cows), with six entries. Though few in numbers, there were some very good animals amongst them.

Jerseys.—The 143 entries of this breed made numerically a full average display. Of the five classes the largest was that for yearling heifers (Class 123) with 38 entries. The older bulls (Class 119) were throughout a strong class. The two-year-old bulls (Class 120) were also a strong class, and included 25 animals of more than average merit. The cows (Class 121) made a very creditable display. Class 122, two-year-old heifers, was filled with a fine selection of young Jerseys, and all the prize-winning heifers gave promise of dairy merit, as well as of beauty and symmetry. The Judges add that the Jersey classes generally were even and good, and included many animals of exceptional merit.

Guernseys.—The entries, 67 in number, were more than the average. Class 128, yearling heifers, with 20 entries, was the largest of the five classes. Old bulls (Class 124) were well represented. The younger bulls (Class 125) were hardly equal in merit to the older ones, but several were of excellent quality. Cows (Class 126) lost some of the interest they would otherwise have had on account of the number of absentees; the Judges direct attention to the disparity of ages in this class. The two-year-old heifers (Class 127) formed the weakest class in the section. The yearling heifers (Class 128) made a most excellent class.

Kerries.—Eleven entries occupied two classes, the larger being that for bulls (Class 129) with six entries. The Judges report them as "not so numerous as we could wish, but quality good."

Dexters.—Sixteen entries were equally divided between the two classes (131 and 132) for males and females respectively. The report states:—

> The Dexters were a very good display indeed, especially the cows, which were of exceptional quality, showing fine milking capabilities combined with true shapes.

Dairy Cattle.—The Consulting Chemist reports on this section as follows:—

> The three Classes, 133, 134 and 135, for cows judged by the test of the quantity or quality, or of both combined, of the milk yielded, were the same as last year at Birmingham.
>
> The awards were made on the basis of the weight of milk produced and the results of chemical analysis of the same. The cows in these three classes were milked dry on the Monday morning, and the milkings of Monday evening and Tuesday morning were taken as the 24 hours' yield for the purposes of the competition.

Awards for Dairy Cows in Classes 133, 134, and 135.

Class 133.—*Cow in-milk, of the Shorthorn, Ayrshire, or other pure breed not named in Class 135, judged for the yield and quality of their milk combined, the milk to contain (on the average of two milkings) 12 per cent. of total solids, of which not less than 3 per cent. shall be fat.* *1st Prize*, £15 ; *2nd*, £10 ; *3rd*, £5.

No. in Catalogue	Name of Exhibitor	Name of Cow	Breed of Cow	Age	Date of Calving in 1899	Yield of Milk: Mon. even.	Yield of Milk: Tues. morn.	Yield of Milk: Total	Quality of Milk: Mon. even. Fat	Quality of Milk: Mon. even. Solids	Quality of Milk: Tues. morn. Fat	Quality of Milk: Tues. morn. Solids	Total Weight of Butter-fat	Awards, Remarks, &c.
				yrs.		lb.	lb.	lb.	per cent.	per cent.	per cent.	per cent.	oz.	
1084	John Evens	*Bountiful*	Lincoln Red	6¼	May 29	22¼	27½	49¾	4·50	13·24	3·30	12·15	30·6	reserve number.
1085	do.	*Old Profit*	do.	11½	May 10	27¾	33	60¾	3·98	12·57	3·08	12·03	33·9	2nd prize.
1086	do.	*White Foot*	do.	7½	May 13	30½	31	61½	4·70	13·45	3·58	12·56	40·7	1st prize.
1088	William Nisbet	*Rosebud*	Ayrshire	8	—	23	33	56	4·50	13·72	3·29	12·42	33·9	3rd prize.
1089	Mrs. Frances Pratt	*Model Duchess*	Shorthorn	4½	June 8	18¼	25¼	43½	4·05	13·60	3·30	12·90	25·1	
1090	do.	*Royal Duchess*	do.	10	June 1	18¼	22½	41¼	3·50	12·35	3·53	12·41	25·2	
1091	Sanders Spencer	*Sweetheart*	do.	8½	May 3	25	35¾	60¾	2·15	10·76	2·50	10·75	22·9	deficient in quality

Class 134.—*Cow in-milk, of any breed, or cross, giving the largest quantity of milk, containing (on the average of two milkings) 12 per cent. of total solids, of which not less than 3 per cent. shall be fat.* *1st Prize*, £15 ; *2nd*, £10 ; *3rd*, £5.

No. in Catalogue	Name of Exhibitor	Name of Cow	Breed of Cow	Age	Date of Calving in 1899	Yield of Milk: Mon. even.	Yield of Milk: Tues. morn.	Yield of Milk: Total	Quality of Milk: Mon. even. Fat	Quality of Milk: Mon. even. Solids	Quality of Milk: Tues. morn. Fat	Quality of Milk: Tues. morn. Solids	Awards and Remarks
				yrs.		lb.	lb.	lb.	per cent.	per cent.	per cent.	per cent.	
1093	E. Murray Ind	*Winnie 2nd*	Jersey	6¾	June 7	12	15½	28½	4·30	13·60	3·23	12·70	
1095	J. F. Spencer	*Graceful*	Shorthorn	7	May 31	27½	33½	61	4·25	13·25	3·40	12·25	2nd prize.
1096	do.	*Maggie*	do.	7	May 24	19¼	24	43¼	3·05	11·23	3·20	11·10	deficient in quality.
1097	do.	*Model Maid 2nd*	do.	7	April 1	32¼	37¾	70	5·70	13·87	3·78	12·15	1st prize.

Class 135.—*Cow in-milk, of the Jersey, Guernsey, Kerry, or Dexter breeds, judged for their butter-producing qualities.* *1st Prize*, £15 ; *2nd*, £10 ; *3rd*, £5.

No. in Catalogue	Name of Exhibitor	Name of Cow	Breed of Cow	Age	Date of Calving in 1899	Yield of Milk: Mon. even.	Yield of Milk: Tues. morn.	Yield of Milk: Total	Butter-fat in the milk: Mon. even.	Butter-fat in the milk: Tues. morn.	Weight of Butter-fat: Mon. even.	Weight of Butter-fat: Tues. morn.	Weight of Butter-fat: Total	Awards and Remarks
				yrs.		lb.	lb.	lb.	per cent.	per cent.	oz.	oz.	oz.	
1098	W. McKenzie Bradley	*Grand Daughter*	Jersey	8	April 2	19½	25¾	45¼	4·13	3·80	12·9	15·6	28·5	Reserve No. & C.
1100	Earl Cadogan	*Clemency*	do.	7	May 3	16	22	38	6·30	4·48	16·1	15·8	31·9	3rd prize.
1101	Captain A. B. Fraser	*Errant*	do.	3½	May 26	15¾	19½	35¼	5·10	3·20	12·9	9·9	22·8	
1103	Mrs. C. McIntosh	*La Croix Primrose*	do.	7	May 16	15½	23¾	39¼	4·60	3·45	11·4	13·1	24·5	
1104	do.	*Zenobia 35th*	do.	7¾	March 6	14¾	17	31¾	5·55	4·35	13·1	11·8	24·9	
1105	J. F. Spencer	*Babraham Belladonna*	Kerry	7	March 21	12	15	27	3·90	4·05	7·5	9·7	17·2	
1106	Dr. Herbert Watney	*Sherbet*	Jersey	8½	April 3	18¾	23½	42¼	5·90	4·10	17·7	15·4	33·1	2nd prize.
1107	do.	*Siphon*	do.	7	April 29	21¾	25½	47¼	6·50	4·45	22·6	18·1	40·7	1st prize.

(Signed) J. Augustus Voelcker, *Consulting Chemist*.

In Class 133, for cows of the Shorthorn, Ayrshire, and other pure breeds (excluding Jerseys, Guernseys, and Kerries), out of 8 entries 7 came into competition, among these being 3 cows of the Lincolnshire Red Shorthorn breed, belonging to Mr. John Evens, of Lincoln, two of them being the same cows that had carried off the first and second prizes in this Class at Birmingham last year. Once again these animals, *White Foot* and *Old Profit*, showed their superiority to the others in the Class, and came out first and second as they did before, the yields in both cases being about 2lb. of milk more in the 24 hours than in 1898, and the amount of butter-fat considerably improved. The third prize was gained by *Rosebud*, an Ayrshire cow, 8 years old. Only one cow gave milk not up to the requisite standard, and that is fully explained by the fact that the cow was unwell.

In Class 134, for cows of any breed or cross, to give the largest quantity of milk, provided it was up to a specified quality, 4 of the 5 entries competed, the first and second prizes going to the same owner, Mr. J. F. Spencer, for two Shorthorn cows, *Model Maid 2nd* and *Graceful*. A third cow of Mr. Spencer's gave milk deficient in quality, and the remaining cow, a Jersey, had no proper place in such a class as this.

In Class 135, for Jersey, Guernsey, Kerry, and Dexter cows, judged essentially for their butter-producing powers, 8 of the 10 entries came to the test. Dr. Herbert Watney took both the first and second prizes with the Jersey cows *Siphon* and *Sherbet*, the former of which has been a competitor at these shows before. The very high yield of 40·7 oz. of butter-fat in two milkings was given by *Siphon*, the milk yield being 47¼ lb. This cow was by far the best of those competing in the Class. The third prize went to Earl Cadogan for *Clemency*, the winner of the first prize in this Class last year at Birmingham, since which time she has, it may be said, lost one quarter. The reserve number was given to Mr. McKenzie Bradley's Jersey cow *Grand Daughter*, which showed a return of 45¼ lb. of milk in the 24 hours, yielding 28½ oz. of butter-fat.

SHEEP.

At a Kent Meeting a big display of Southdowns was a foregone conclusion. Accordingly, they not only far exceeded their own average of recent years, but they furnished the largest entry of any breed, and thus displaced the Shropshires from the position of pre-eminence the latter are accustomed to occupy. The influence of locality is further seen in the remarkably large entry of Kentish or Romney Marsh sheep, which rank third in total numbers, the Hampshire Downs succeeding next, and then the Lincolns. It will be seen from the table on the next page that the Devon Longwools, which have not been seen in the Society's Showyard for some years, had a section allotted to them on this occasion.

Leicesters.—The entries, numbering 30, were below the average; they represented four separate flocks. Two-shear rams (Class 136) made up a fair class, without any sheep of extraordinary merit. Shearling rams (Class 137) were rather disappointing as a whole. For ram lambs (Class 138) no

difficulty was felt in awarding the first prize. Shearling ewes (Class 139) made up a very good class, possessing size, substance, and—the prize pens—good breeding. Ewe lambs (Class 140) were a fair class.

Entries of Sheep at the last Five Country Meetings, 1895–99.

—	Maidstone, 1899	Birmingham, 1898	Manchester, 1897	Leicester, 1896	Darlington, 1895
PRIZES OFFERED	£1,410	£1,275	£1,275	£1,291	£1,170
Sheep	No. of Pens	No. of Pens	No. of Pens	No. of Pens	No. of Pens
Leicesters . . .	30	35	60	42	44
Cotswolds . . .	21	32	21	20	12
Lincolns . . .	61	75	73	50	27
Oxford Downs . .	31	44	27	28	25
Shropshires . . .	103	147	141	127	93
Southdowns . . .	114	84	74	64	50
Hampshire Downs .	66	59	58	60	38
Suffolks . . .	44	13	18	23	23
Border Leicesters . .	24	36	61	42	47
Somerset and Dorset Horned . .	4	6	10	7	8
Kentish or Romney Marsh . .	86	27	19	23	15
Wensleydales . .	12	18	21	14	47
Devon Long-woolled .	11	—	—	—	—
Cheviots	8	8	8	7	12
Black-Faced Mountain.	9	12	19	12	28
Lonks	—	6	7	4	8
Herdwicks . . .	2	6	15	10	14
Welsh Mountain . .	5	16	17	18	14
Total Entries of Sheep	631	624	649	551	505

Cotswolds.—Twenty-one entries were contributed from four flocks. Of two-shear rams (Class 141) there were only two entries, but both were up to prize standard. Shearling rams (Class 142) were very good, quite keeping up the character of the breed. Ram lambs (Class 143) were represented by some very good lambs in the prize pens, but they did not quite match. Shearling ewes (Class 144) made up a good class, and the third prize was deservedly bestowed. The ewe lambs (Class 145) were fair specimens of the breed. The Judges say:—

We consider the Cotswolds as a whole were well shown, and especially so in Classes 142 and 144, which contained some really good animals. We hope to see more pens exhibited in the future.

Lincolns.—Sixty-one entries were made from ten distinct flocks. The two-shear rams (Class 146) furnished the champion

ram. Shearling rams (Class 147) included many very good sheep, but none quite so good as the Judges have seen exhibited. Pens of five shearling rams (Class 148) were of great merit—the first three pens together have hardly ever been equalled. Ram lambs (Class 149) were on the whole very good. Shearling ewes (Class 150) furnished two excellent pens, as good as the Judges have ever seen; the others were about an average. Ewe lambs (Class 151) made up quite a good class.

Oxford Downs.—Thirty-one entries came from eight separate flocks. Shearling rams (Class 153) comprised a lot of big, good, rent-paying sheep; taken as a whole they were an exceptionally good class, the best seen for many years. Ewe lambs (Class 155) made a very pretty feature of the display.

Shropshires.—The 103 entries represented 21 flocks. Two-shear rams (Class 157) were of only moderate merit. Many of the shearling rams (Class 158) were of even merit. Ram lambs (Class 159) furnished by far the strongest section of the male animals, many showing distinct promise for the future. Shearling ewes (Class 160) were characterised by good specimens all through the class. Ewe lambs (Class 161) made up an excellent class, which contained many animals of promise.

Southdowns.—Twenty-four flocks supplied a total of 114 entries. The six classes collectively furnished what was probably the best exhibition of the breed that has ever been seen at "the Royal." Two-shear rams (Class 162) were remarkably good, and included the champion ram, "a rare specimen of the old Goodwood type, combining good character and style with the best quality of mutton and wool." Shearling rams (Class 163) formed a very strong class. Ram lambs (Class 164) included some exceedingly good pens. Ewes other than shearling (Class 165) made up a good but not a numerous class. Shearling ewes (Class 166) were a beautiful class of thirteen pens, and probably for quality, symmetry, and trueness of type, the best of the six classes. Ewe lambs (Class 167) formed a remarkably good class, but were very difficult to judge owing to there being so many well-matched pens of excellent quality.

Hampshire Downs.—The 66 entries came from nineteen different flocks, so that the competition was proportionately greater than in most other breeds. The section as a whole possessed great merit. Shearling rams (Class 169) were all good, and the three prize pens ran each other very closely. Ram lambs (Class 170) were represented by some excellent pens. Shearling ewes (Class 171) were the weak class of the breed, "owners probably declining to run the risk of ruining

the best specimens of their flocks, for breeding purposes, by preparing them for show." Ewe lambs (Class 172) were throughout of such uniform merit that they were all commended.

Suffolks.—Forty-four entries were made from 11 flocks. Subjoined is the Judges' report:—

We were pleased to see that the several classes for Suffolk sheep were well filled. In the ram lamb and ewe lamb classes there were some exhibits of special quality. We were pleased to notice the marked improvement in the Suffolk sheep during the past few years.

Border Leicesters.—Two dozen entries represented seven flocks. Two-shear rams (Class 178) were a poor class. Shearling rams (Class 179) were fairly good. Ewes (Class 180) were of only average quality, and every pen was more or less faulty.

Kentish or Romney Marsh.—The 86 pens were entered from 17 separate flocks. Old rams (Class 181) made up a class full of merit. Shearling rams (Class 182), though of good quality, were not so even as the older sheep, and the Judges were a little disappointed at some of the exhibits. The lambs (Classes 183 and 186) were of good quality, but as they are born much later than in many other breeds they were not shown to advantage. The exhibits of ewes, both old and young (Classes 184 and 185), were the best the Judges have seen for many years, being excellent in quality and with good wool.

Wensleydales.—Twelve entries came from five flocks, and made on the whole a creditable show. Amongst the rams (Class 187) were some very useful sheep, whilst the ewes (Class 188) were an exceedingly nice lot, which did great credit to the breeders.

Devon Long-woolled.—Four flocks supplied 11 entries. Rams, both two-shear and shearling (Class 189), were of excellent merit, and ewes (Class 190) were very good throughout.

Somerset and Dorset Horned.—The four entries were all from one and the same flock. The Judges say:—

We regret this breed was shown in very limited numbers. The exhibits were, however, meritorious and characteristic of the breed.

Cheviots.—Eight entries were supplied in equal numbers from two flocks. The rams (Class 193) included no shearlings, but all the two-shears exhibited possessed considerable merit. Ewes (Class 194) were excellent.

Black-faced Mountain.—Nine entries represented four flocks. The Judges report:—

Black-faced Mountain sheep were not numerous owing to the Society having its Meeting this year so far away from where these hardy and most

useful sheep are bred. The quality of the exhibits was quite up to the average seen at the Royal Show. Competition was pretty close in both classes, and we made it a point to award the prizes to animals that had in our opinion breeding points, overfeeding not weighing too much in our judgment.

Herdwicks.—The ram class was vacant, and in the ewe class there was only one pen, well worthy of the first prize.

Welsh Mountain.—Five entries were made from three flocks. The Judges found them to be of superior quality, and experienced some difficulty in deciding the awards in the ram class.

Pigs.

The display of pigs was, in all sections, below the average of the three preceding years, as may be seen from the figures in the subjoined table:—

Entries of Pigs at the last Five Country Meetings, 1895–99.

—	Maidstone, 1899	Birmingham, 1898	Manchester, 1897	Leicester, 1896	Darlington, 1895
Prizes offered	£360	£389	£462	£432	£432
	No.	No.	No.	No.	No.
White	77	101	86	62	—
Berkshire	49	53	59	55	—
Black	—	—	10	3	—
Tamworth	21	44	30	24	—
Total Entries of Pigs	147	198	185	144	—

Large White.—There was an entry of 43 pens. The old boars (Class 201) furnished the breed champion. The younger boars (Class 202) were very deficient in their legs, particularly the fore-legs, and the class was below average merit. The sows (Class 203), after the prize winners were taken out, were under average quality. Sow pigs (Class 204) were of no special merit.

Middle White.—The entry comprised 22 pens. The old boars (Class 205) were only moderate. There was a fair entry of sows (Class 207), amongst which the breed champion was found.

Small White.—A dozen pens were entered. Boars (Class 209) made up a small entry of good quality. The other classes possessed no special merit.

Berkshires.—The old boars (Class 213) were a good class. Young boars (Class 214) were disappointing, though some of

the pens contained individual pigs of high merit. The sows (Class 215) were undoubtedly the foremost class in the section, and much care was necessary in awarding the prizes; they included the breed champion. Sow pigs (Class 216) did not attain the same standard of excellence as the sows.

Tamworths.—The Judges report the classes not to be so well filled as they should be, considering the liberality of the Society's prize list and the popularity of the breed.

POULTRY, INCLUDING DUCKS, GEESE, AND TURKEYS.

The aggregate entry of poultry, numbering 669, was lower than in any of the ten preceding years. The following table shows that the decline in numbers was participated in by each of the sections:—

Entries of Poultry at the last Five Country Meetings, 1895–99.

—	Maidstone, 1899	Birmingh'm, 1898	Manchester, 1897	Leicester, 1896	Darlington, 1895
PRIZES OFFERED	£268 10*s.*	£257	£257	£245	£234
	No.	No.	No.	No.	No.
Fowls	552	758	691	701	619
Ducks	56	84	84	80	63
Geese and Turkeys	27	55	42	42	27
Table Poultry	34	67	50	78	60
Total Entries of Poultry	669	964	867	901	769

The entries at Maidstone included the following totals:—

Game	81	Orpington	54	Hamburgh	11
Dorking	67	Houdan	18	Any other recognised breed	17
Brahma and Cochin	35	French (except Houdan)	12	Table Poultry (pairs)	20
Langshan	32	Minorca	35	Table Ducklings (pairs)	14
Plymouth Rock	44	Leghorn	34		
Wyandotte	96	Andalusian	16		

Poultry.—*Old English Game* formed an important feature of the department, the classes being well filled and the exhibits generally very good. *Indian Game*, considering the time of year, were excellent. *Dorkings* included some very typical birds, and well maintained their unrivalled excellence as table fowls. The chickens were well grown, of great promise, and did credit to their breeders. *Brahmas* were fair, but the hen

class was rather weak. *Cochin* cocks were good, with lots of feather, but hens were poor. Pullets of the two last named varieties were good. *Langshans* were represented by four good classes, though some of the birds were deficient in breast. *Plymouth Rock* classes were large, thus demonstrating their popularity as a useful and paying variety, and on the whole the exhibits were good. *Wyandottes* were of good quality, but the chickens were backward in feather. *Orpingtons* in the adult classes provided, in the winners, large typical birds sent to the Show in splendid condition; the chickens were not so forward, as is sometimes the case. *Houdans* were of very good quality, but the chickens not sufficiently developed. *French* (except Houdan) included some capital Crêves and some good La Flèche. The first appearance at the Society's Show is noted of the latest introduction from the French poultry yards, in the shape of four Faverolles; they were not, however, of sufficient merit to obtain prizes. *Minorcas* were in good plumage for the time of year, and were well represented, some very forward chickens being shown of this good egg-producing variety. The same remarks apply to *Leghorns* and *Andalusians*, the White Leghorns being best. *Hamburghs* were a small but fair show. *Any other recognised breed* included Silkies, Scotch Greys, Malays, Spanish, and Polish, the last-named being not often seen now.

Ducks.—The entries comprised 21 Aylesbury, 11 Rouen, 3 Pekin, 9 Cayuga, and 12 of any breed (except Aylesbury). The *Aylesburys* were of fine size and well shown. *Rouens* included some fine birds, but they were not in good feather. *Pekins* were a poor lot; *Cayugas* were fair. *Any breed* classes were a fine forward lot, with Rouens much the best.

Geese.—There were only 11 entries, one class (Toulouse Goose) being vacant. All the exhibits were good, both Embden and Toulouse.

Turkeys.—The entries comprised 9 cocks and 7 hens, and the first prizes in both classes went to grand birds.

Table Poultry.—The following is the report of the Judge in this section:—

The show of Table Poultry this year was smaller than usual, and this is to be regretted considering the large amount of poultry produced in the South-east counties of England. A few of the exhibitors were from that district, but the majority came from other parts of the country. Taking the Table Poultry as a whole, they were not quite as good as at either Manchester or Birmingham, many of the specimens being rather hard, and although I did not come across any birds that could reasonably be thought hatched previous to January 1, yet many of them would have been better had they been killed a month or five weeks earlier. The work of killing

and plucking was very well done by Messrs. W. T. Wallond & Son, of High Street, Maidstone.

The weights alive and dead of the first prize winners in each class were as follows:

Class	No. in catalogue	Alive		Dead	
		lb.	oz.	lb.	oz.
309	2525	7	4	6	11
		8	4	7	12
310	2528	5	7	4	8
		5	1	4	7
311	2533	6	15	6	6½
		7	0	6	6½
312	2536	5	9	4	15½
		5	12	5	4
313	2538	7	9	6	14
		7	0	6	6
314	2540	5	9	4	13
		5	3	4	7½
315	2542	5	12	5	3
		4	15	4	5½
316	2552	6	9	5	13½
		6	11	5	15½

Exhibitors should bear in mind the desirableness of having couples of birds as even in size as possible.

In Class 309, for pure-bred cockerels, were five entries, and, strange to say, not a single pair of Dorkings among them; in fact, this was equally true of the pullet class. The winners (2525) were Indian Game, very good in external appearance, especially before killing, and making big meaty birds, with white flesh, though undoubtedly hard. The 2nd prize winners were dark-plumaged Faverolles (2523), very correct in what are esteemed the points of this variety, large when killed, very white in flesh, rather coarse in skin, but nice in shape; 3rd were very good buff Wyandottes (2522), fleshy and even, and a nice pair—probably they would have occupied a higher position, but were hard in flesh; R. and H.C., Indian Game (2521), uneven in flesh; H.C. (2524), Faverolles, also uneven.

In Class 310, for pure-bred pullets, there were four entries, one being absent. 1st (2528), fawn Faverolles, five toes, nice legs, and a very good pair both as to colour and length of body; 2nd (2527), buff Wyandottes, moderate in size, fairly meaty, and capable of great improvement by fattening; R. and H.C. (2526), Indian Game, rather dark in the flesh.

In Class 311, for Indian Game and Dorking cockerels, there were four entries, one absent. 1st (2533), much of the Dorking type, long in body, well-fleshed, good colour; 2nd (2532), fine in bone and nice coloured legs, rather of the Game type, one of these killed well but the other was rough; R. and H.C. (2530) heavy in bone, and one dented in the breast bone.

In Class 312, Indian Game and Dorking pullets, there were three entries. 1st (2536), Indian game plumage, but white legs, and very long, a very good couple though a little rough; R. (2535), Indian Game type, also good legs, uneven in colour. This famous cross was certainly below what we have been accustomed to see.

In Classes 313 and 314, for other first crosses, there were only two entries in each class, In Class 313 the 1st (2538) were Indian Game and Sussex,

rather heavy in bone and decidedly hard; R. and H.C. (2537), Indian Game and Faverolle, meaty, good colour, but also hard. In Class 314 the 1st (2540) were Indian Game and Faverolle, yellow legged but five toes, a lovely pair, good colour, in perfect form, and decidedly the best couple of chickens in the Show; R. (2539), good Wyandotte and dark Dorkings, one with yellow and the other white legs, a meaty pair but rather uneven, and one had a nasty tumour on the breast.

Table Ducklings (Class 315) were better classes, and of pure bred there were eight entries, one absent. 1st (2542), Aylesbury, nice shape, but a little uneven, one a perfect beauty, the other hardly so good; they won, however, by quality of flesh; 2nd (2547), also Aylesbury, rough in plumage, much larger than the winners, but very greasy; 3rd (2541), Cayugas, very nice mellow flesh, but of course did not look so well as the other varieties; R. and H.C. (2544), Aylesbury, losing a little bit in shape, and rough, moderate in colour. In the cross breds (Class 316) there were six entries, two absent. 1st (2552), Rouen and Aylesbury, with plumage of the former type, good bodies, very white flesh and meaty; 2nd (2551), Aylesbury and Pekin, very large, but red in flesh and rough; R. (2554), Pekin and Aylesbury, an uneven pair.

Dairy Produce.

The entries of both Butter and Cheese were considerably below the average of recent years, as may be learnt from the subjoined table:—

Entries of Produce at the last Five Country Meetings, 1895–99.

—	Maidstone, 1899	Birmingh'm, 1898	Manchester, 1897	Leicester, 1896	Darlington, 1895
Prizes offered	£539	£252	£406	£309	£286
	No.	No.	No.	No.	No.
Butter	121	225	187	141	145
Cheese	74	120	195	153	130
Cider and Perry	104	112	89	95	30
Hops	62	—	—	—	—
Preserved Fruits and Vegetables	6	—	—	—	—
Jams, &c.	—	—	—	—	5
Hives and Honey	258	178	244	185	166
Total Entries of Produce	625	635	715	574	476

Butter.—Four classes were provided. Class 317 was for kegs of butter delivered on May 6, or six weeks before the Show, and there were seven entries. With the exception of the first and second prize lots the butter was very inferior, and one entry distinctly bad. Class 318 was for boxes of twelve 2-lb. rolls, made with not more than 1 per cent. of salt, and attracted ten entries. It was a very fair class, the first prize lot being of exceptionally good quality, and well and neatly

packed. The second prize was withheld, as the lot next in merit could only be considered a third-class butter. Class 319, for fresh butter, slightly salted, comprised 60 entries, and as a whole the butter was of excellent quality, but some of the exhibits were badly made up, their appearance not being good. Class 320, fresh butter, slightly salted, made from milk from cows other than Channel Islands, or cows crossed with Channel Islands breeds, included 44 entries. This class was excellent, but, as in the previous class, the appearance was not so good as it should be. With regard to Classes 319 and 320, the Judges add :—

In both these classes the butter was mostly made up without mark, but a few lots had patterns on. We would suggest that patterns of any kind should be prohibited, and that in Condition 86, for "not stamped" should be substituted "without mark or pattern."

Cheese.—The classes were all for cheese of this year's make. Of *Cheddar* there were 16 entries, and the general display was fine, though the first and second prize lots stood out very boldly. Of *Cheshire* (17 entries) many of the lots had been affected by heat, and were not true in colour; the first prize lot stood quite by itself. *Stiltons* (9 entries) were very medium as a whole, none showing superlative merit. *Wensleydales* (5 entries) were very poorly represented, and in a heated condition. *Any other British make* (12 entries) included varieties described as Double Gloucester, Leicester, Somerset Thin, Derby, North Wilts Loaf, Wiltshire Loaf, Somerset Loaf, Dorset Truckle, Caerphilly, and Gorgonzola. The Judges say :—

This being an extremely mixed class there was great difficulty in deciding the prizes, and we suggest that another year the Coloured cheese should be in a separate class from the White. This would simplify matters a great deal, and the prize money given to this one class would be sufficient to make a class of both White cheese and Coloured cheese.

Cream cheese competed in two classes—Class 326, made with the use of rennet (5 entries), and Class 327, made without the use of rennet (10 entries). The Judges report :—

A very inferior lot of entries. Most of the cheeses sent in were over-ripe or lacking in flavour or texture.

Cider and Perry.

A total of 104 entries in the four classes made up an aggregate exceeding the average. As at Birmingham last year, arrangements were effected to enable visitors to sample the

exhibits at certain specified times. In the course of their report the Judges say:—

We were pleased to find an increased interest being taken in these beverages, evidenced by the large number of entries sent in for competition by makers from most of the principal cider-producing districts of this country. Taken as a whole, the cider, both in cask and bottle, was of fair quality for the season, but the perry was certainly not so good as we expected to find it.

In Class 328, Cider in cask, we selected only seven lots from a total of twenty-nine entries in competition for the three prizes, all the others being much below the mark, several having acquired a bad flavour from the impure wood of the cask, while others seemed to have been fortified with spirit, and had not had sufficient time to ripen.

Class 329, Cider in bottle. We were only able to select ten exhibits out of a total of forty, many of the samples being unstable and unreliable to stand transit in hot summer weather, the exposure to the high temperature to which they were subjected under canvas setting up a secondary fermentation, exhibiting in many cases faulty management in their manufacture.

Class 330, Cider made in any year before 1898. Some of these lots were very good, but others, although old and matured, rushed from the bottle on opening, and were by no means satisfactory.

Class 331, Perry in bottle. The exhibits in this class were disappointing, both in flavour and quality, but although harsh and, we might almost say, disagreeable to the taste, were sounder than much of the cider.

Hops.

Nearly two-thirds of the hop acreage of England is restricted to the county of Kent, so that a section for Hops commended itself as eminently suitable at a Kentish Meeting. To have limited the competition to Kent alone would, however, have lessened its interest, and accordingly classes were so arranged as to secure a representative display from each of the main hop-growing districts of England. Six classes were thus provided by the Maidstone Local Committee, with three prizes of 20*l*., 10*l*. and 5*l*. in each, the entry in every case consisting of one pocket of hops. The entries were thus distributed:—Class 332, East Kent hops (15 entries); Class 333, Mid-Kent hops (14 entries); Class 334, Weald of Kent hops (6 entries); Class 335, Hants or Surrey hops (10 entries); Class 336, Hereford or Worcester hops (8 entries); Class 337, Sussex hops (8 entries). The following is the report of the Judges:—

The entry of sixty-one samples in the hop classes is a good representation of the year's growth, some classes being remarkably fine, notably the East Kents, and the prize winners in the Hants, Surrey, and Worcester classes.

We found some samples showing crust, apparently from being badly stored. To this we wish to call special attention in the interest of those growers who have not taken proper care of their hops.

Preserved Fruits and Vegetables.

Prizes were offered in five classes, but in three of these there was no entry, namely, Class 338, dried or evaporated fruits; Class 339, dried or evaporated vegetables; Class 341, collection of preserved fruits for dessert purposes, in boxes or other suitable receptacles. Four entries were made in Class 340, collection of bottled fruits (whole fruits) in clear glass bottles, and the Judges found them of excellent quality—"the first prize collection could hardly have been surpassed in merit; the second was also of exceptional merit." Two entries constituted Class 342, collection of jams to be shown in 1-lb. clear glass jars, but only one of the entries possessed any merit. The Judges say:—

The whole section is very disappointing, considering that the Show is held in the centre of the best fruit-growing district in England. Kent has often far exceeded this at its local shows.

Hives, Honey, &c.

Twenty-four classes were assigned to this section, and attracted altogether 258 entries, a total considerably above the average. The Judges send the following report:—

We are much gratified in being able to report a very conspicuous success in the Bee Department of the Show at Maidstone. Not only were the entries among the highest ever recorded in the annals of the Royal Agricultural Society, but so few of the whole number (258) were absent from the Show-bench that it is safe to say the display, as a whole, has never been excelled in this department.

In the class for collections of hives and bee-appliances, eight exhibits were set up, each of which formed a small show in itself for extent and variety of the goods staged. Then came nearly a dozen observatory hives stocked with bees, followed by seven "Outfits for Beginners in Bee-keeping," and over forty exhibits of hives, honey-extractors, and other bee appliances of a miscellaneous character. Regarding this portion of the department it may be said that manufacturers apparently relied on staging hives of established types and good repute rather than on bringing out anything new in form or involving new methods of management. This was exemplified in the fact of no awards being made in the class for "New and Useful Appliances introduced since 1897."

Considering the unfavourable character of the earlier parts of the season, the honey classes were well represented, some exhibits both of comb and extracted honey being of very high quality. In the classes for Section-honey the Judges found it necessary to disqualify no less than six exhibitors (under Rule 119) for leaving less than three inches of the comb surface exposed. In every case these exhibits were among the best in their respective classes, nor was any advantage to be gained by infringing the rule (as might have been supposed), the covering up of the edges

by lace-paper being quite unnecessary, so good was the sealing of the sections.

Class 355, for light coloured extracted honey of the current year, was an exceedingly good one, the colour and general excellence of the exhibits staged being uniformly good.

Class 356, for dark honey gathered in 1899, was a poor one, some very inferior honey being shown.

Class 357, for "Liquid honey of any previous year," was an exceptionally good one, and contained some of the best honey shown in the department; indeed, for consistency and flavour this class was unsurpassed, the result being a very keen competition.

Class 359, for "Granulated honey of any previous year," was well represented, but some of the exhibits were inferior in quality.

In Class 360 four honey trophies were staged, some of which were very tastefully arranged.

Of the remaining classes, mention must be made of the two for bees'-wax, which produced a good entry, and some capital samples were staged, the best being equal to any we have yet seen. The new class for "Wax shown in Marketable Cakes, suitable for the Retail Trade," was both instructive and useful, as tending to promote the sale of pure British bees'-wax.

The Show was visited on two days by a deputation representing the Bee-keepers' Association of the Department of Aisne, France, headed by Monsieur Laurent Opin, Secretary of the Association. The visitors were shown round the Bee Department, and expressed themselves as both highly pleased and instructed by what they saw of British Bee-keeping, by which they hoped to profit on their return to France. The Vice-President of the New South Wales Bee-keepers' Association, Mr. James Wilshire, also attended the Show, and especially desired to express his warm admiration of the Bee Department and all he saw therein. Mr. Wilshire likewise took great interest in Mr. Herrod's lectures and manipulations in the bee-tent, which he appreciated very much, as "conveying valuable information in simple, well-chosen words that all could understand."

Horse-shoeing Competitions.

These contests, carried out as usual at the Shoeing Forge, were open to shoeing-smiths in any part of the United Kingdom. The following is the Judges' report:—

We have much pleasure in reporting that the work was well and carefully executed, several of the men showing considerable ability in preparing the foot and in turning and fitting the shoe. A fair knowledge was also displayed of the structure of the horse's foot.

In Class I. (Light Horses) there were twenty-two competitors. We awarded six prizes and four commendations. We recommend W. J. Bradley, the first prizeman, for the freedom of the Guild of the Worshipful Company of Farriers of London, and although we are unable to award them prizes, we consider W. Gates, A. Price, and Corporal Sibley to be qualified for admission to the Register of that Company.

In Class II. (Heavy Horses) there were thirty-one entries, twenty-eight of whom competed. Six prizes were awarded and seven commendations. We recommend George Jones, the winner of the first prize, for the freedom of the Guild of the Worshipful Company of Farriers.

On the Wednesday morning an appreciative audience assembled at the Shoeing Forge to listen to an illustrated lecture by Mr. John Malcolm, F.R.C.V.S., one of the Judges, on "The Horse's Foot, and How to Shoe it."

CONCLUSION.

As a perfectly ordered display, brought together in a charming locality, the Maidstone Exhibition can have left nothing but agreeable impressions upon those who visited it. By its means there were carried into a corner of England choice representatives of many British breeds such as had never been seen in that part of the country before, whilst of the better known or more widely distributed breeds some of the most noted specimens were on view. The display of implements and machinery, though not so large as in most recent years, left nothing to be desired in point of quality or in wealth of illustration, and such an imposing demonstration of the mechanical aids to agriculture has never previously been afforded in the south-east of England. Nevertheless, the public support accorded to the Show was so inadequate that financial failure became inevitable.

In the interests alike of English Agriculture and of the Society it is desirable that the Shows should not only continue to maintain the high degree of technical success which has long been associated with them, but that they should result in something better than a drain upon the Society's funds. It will be generally felt that the time has come when a reconsideration of the Society's present system of rotation of districts may advantageously be undertaken. It may be hoped, therefore, that the Special Committee to whom this inquiry has been remitted by the Council will be able to devise a scheme which, while providing for the annual continuance on their present scale of these great national agricultural gatherings, may make the holding of them less of a financial risk to the Royal Agricultural Society than hitherto.

W. FREAM.

13 Hanover Square, W.

THE TRIALS OF CREAM SEPARATORS AT MAIDSTONE.

Of all the machines in general use on a farm there is none more scientifically and delicately constructed than the cream separator, neither is there any whose working it is more difficult to follow. So great, however, has been its success that a separator is now regarded as an essential in every properly equipped dairy. When it is remembered that the first machine for separating cream from milk by means of centrifugal force was the "Laval" separator, invented by Dr. Laval, a Swedish chemist, and exhibited at the Royal Show at Kilburn in the year 1879, it must be acknowledged that the principle has come to the fore and established itself in a remarkably short time.

In the year 1891 the Royal Agricultural Society offered prizes for Cream Separators at the Show at Doncaster. Entries were made by four firms, and the results of the competition were duly recorded in the Journal.[1] Since 1891, however, so many alterations and improvements have been introduced that it was considered advisable to hold a further competition, and accordingly, in the Implement section, the following prizes were offered this year at the Maidstone meeting:—

Class II.

Cream separator: Power machine, suitable for farm use. 1st prize, 20*l.*; 2nd prize, 10*l.*

Class III.

Cream separator: Hand-power machine, the power taken to drive the same not to exceed 2,500 foot lb. 1st prize, 20*l.*; 2nd prize, 10*l.*

The points which the Judges were directed to specially consider were the following:—

Price.
Power taken per gallon.
Time taken per gallon.
Efficiency of separation.
Means of regulating thickness of cream.
Facility for dismantling and cleaning.
Mechanical construction.
Freedom from froth, both of separated milk and cream.

[1] See *The Trials of Cream Separators at Doncaster*, Journal R.A.S.E., 3rd series, vol. ii., 1891, p. 497.

The following machines were entered for trial :—

CLASS II.—*Cream Separators* (*Power Machines*).

No. in Catalogue.

2545 Watson, Laidlaw & Co., 98 Dundas Street, Glasgow. "Princess," belt-power, price 55*l.* Declared output per hour 250 gallons.
2546 Watson, Laidlaw & Co., 98 Dundas Street, Glasgow. "Princess," driven by steam turbine, price 32*l.* 10*s.*, stand 22*s.* 6*d.* extra. Declared output 100 gallons.
2567 The "Fram" Dairy Machinery Co., 1 Holborn Circus, London, E.C. "Fram," No. 4, price 29*l.* 5*s.* Declared output 75 gallons.
2892 Melotte Separator Sales Co., Counterslip, Bristol. "Melotte," No. 5, price 27*l.* 10*s.* Declared output 85 gallons.
3922 Dairy Supply Co., Museum Street, London, W.C. "The Farmer's Surprise," No. 3, price 31*l.* Declared output 110 gallons.
3923 Dairy Supply Co., Museum Street, London, W.C. "The Farmer's Surprise," No. 4, price 35*l.* Declared output 150 gallons.

CLASS III.—*Cream Separators* (*Hand-power Machines*).

2547 Watson, Laidlaw & Co., 98 Dundas Street, Glasgow. "Princess," hand-power, price 19*l.* Declared output 50 gallons.
2548 Watson, Laidlaw & Co., 98 Dundas Street, Glasgow. "Princess-Victoria," hand-power, price 12*l.* Declared output 25 gallons.
2549 Watson, Laidlaw & Co., 98 Dundas Street, Glasgow. "Victoria," hand-power, price 8*l.* Declared output 10 gallons.
2568 The "Fram" Dairy Machinery Co., 1 Holborn Circus, London, E.C. "Fram," No. 2, price 17*l.* 17*s.* Declared output 44 gallons.
2785 Pond & Son, Ltd., Prize Dairy Works, Blandford, Dorset. "Crown," price 20*l.* Declared output 50 gallons.
2812 Vipan & Headly, Church Gate Works, Leicester. "Butterfly," No. 1, price 9*l.* 10*s.*, stand 20*s.* extra. Declared output 16 gallons.
2813 Vipan & Headly, Church Gate Works, Leicester. "Butterfly," No. 2, price 11*l.*, stand 20*s.* extra. Declared output 27 gallons.
2893 Melotte Separator Sales Co., Counterslip, Bristol. "Melotte," No. 2, price 18*l.* 10*s.* Declared output 45 gallons.
3924 Dairy Supply Co., Museum Street, London, W.C. "The Farmer's Surprise," No. 1, price 12*l.* Declared output 45 gallons.

It will be seen that four separate firms competed in the "power machine" class, and six in the "hand-power machine" class, and that altogether six different firms entered for the trials.

All the entries put in an appearance at the Maidstone Show-yard, and were ready to start at the time appointed. The trials commenced on Wednesday June 14. At the commencement the Judges—Mr. Douglas Gilchrist and myself—were met by a difficulty, inasmuch as the first three machines on the list were driven by self-contained steam turbines, while the last three were driven by belts, so that it was practically impossible to exactly compare the power taken.

In the case of the three turbine-driven machines, the turbine

acting direct on to the bowl spindle and forming an essential feature of the machine, it was a little difficult to make a precise comparison of the power taken as compared with the belt-driven machines, as in the latter case no losses in shafting or engine were considered, whereas in the turbine machines any loss that might occur in the turbine was included.

As a comparative test of the power taken to work these machines, steam was supplied to them from an independent small boiler, and the quantity of water used by each machine from the time that steam was turned on until separation was completed was carefully weighed.

Referring to the trials of light portable motors at Plymouth (Journal, 3rd series, vol. i. 1890, p. 589), it will be seen that the steam consumption for single engines indicating 5·17 and 6·20 H.P. was at the rate of 64·73 lb. and 57·75 lb., or a mean of 61·7 lb. of steam for 5·6 H.P. The actual steam consumption measured for the turbines compares favourably with that of an engine of one H.P., a smaller engine and boiler than which is not likely to be used in any dairy using steam power.

During the trials the milk for each day's use was placed in a receptacle and kept constantly stirred, and a sufficient quantity for a 20 minutes' run carefully weighed out to each machine, a sample of the milk being at the same time taken for analysis by Dr. Voelcker, the Society's Consulting Chemist. After separation, the separated milk and the cream and the contents of the bowl of the machine were separately weighed, and samples taken for the same purpose. Before running, each exhibitor heated the milk to what he considered the most suitable temperature.

Several runs were made for various purposes, such as ascertaining the power taken, the efficiency of the arrangements for producing either thick or thin cream, &c.

It is satisfactory to be able to say that all the machines were capable of separating the amount of milk claimed for them.

Class II.—Power Separators.

No. 3922, *The Dairy Supply Company's* Cream Separator, "The Farmer's Surprise," No. 3, Steam Turbine, price 31*l*.—This machine claims to be the direct descendant of the first Laval machine which was exhibited at the Royal Show at Kilburn in 1879, though it has been so much improved that it has little in common with its progenitor.

The original machine had an "empty" bowl, but in the

year 1891 it was fitted with cone-shaped discs placed inside the bowl, these being arranged one over the other on a central tube, and entirely filling the bowl with the exception of a space of about $\frac{1}{16}$ inch between each disc, and being kept apart by small projections on the surface of the discs. The effect of these discs is to split the milk into thin layers, the result of which is to enormously increase the rapidity with which the separation is effected.

This year another most important improvement has been introduced. Hitherto the in-flowing milk has passed down the central tube to the bottom of the bowl, where it escaped through

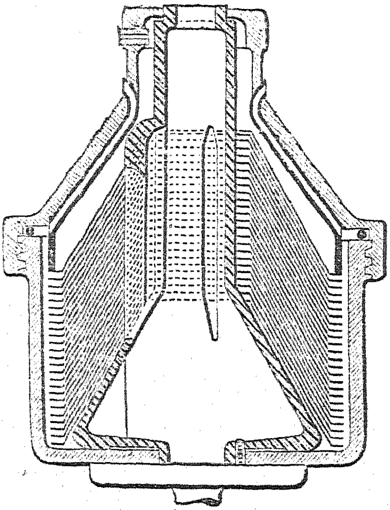


FIG. 1.—"The Farmer's Surprise" Cream Separator. Vertical section through bowls, cones, and central tube, showing projecting slots through which milk is delivered.

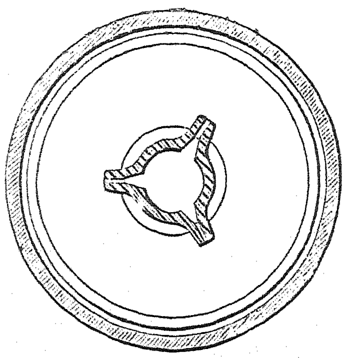


FIG. 2.—"The Farmer's Surprise" Cream Separator. Sectional plan through bowl and central tube, showing slots in projecting wings.

an outlet, and, in order to distribute itself amongst the discs, had to make its way through the cream which had already been separated, thus disturbing the latter, and partially undoing the work of separation. In the improved type (figs. 1 and 2) the milk flows, as hitherto, down the central tube and escapes through narrow slots made in wings, which project from the central tube far enough to deliver the milk outside the inner wall of cream, and at a point where the specific gravity of the contents of the bowl corresponds with that of the incoming milk, thus reducing the disturbance caused by the entry of fresh milk to a minimum. The slotted wings have the further advantage of giving a more even distribution of the milk to the discs than was hitherto

the case, and as they project into the discs, which have slots cut to fit the wings, they give great stability to the stack of discs and a better drive than was obtained with the small feather of the older machine. The effect of the improvement is to very greatly increase the capacity of the machine without adding to the cost.

This machine was supplied with 360 lb. of milk, which was then heated to a temperature of 120° F. The bowl was driven at 6,500 revolutions per minute. In $19\frac{1}{2}$ minutes all the milk was separated, with the following result:—

	lb.
Weight of cream	$29\frac{1}{2}$
Weight of separated milk	$323\frac{1}{2}$
Left in drum	$1\frac{1}{2}$
Loss	$5\frac{1}{2}$
	per cent.
Amount of butter-fat in separated milk	0·167

The running of this machine was particularly smooth and quiet. On opening the machine after the run, the discs were found to be very clean and clear of cream, and the bowl free from curds. The steam turbine, which is easy of access, is placed directly under the bowl, the spindle of which rests in an iron cup attached to the turbine spindle, and having a cross-pin fitted into a slot, thus giving a positive drive to the bowl. The turbine wheel itself is $5\frac{3}{4}$ inches diameter by $\frac{13}{16}$ inch wide, and has on its periphery a number of buckets, in appearance somewhat like those of an overshot water-wheel, against which a jet of steam impinges. The arrangements for lubrication are good, and, as far as could be judged from so short a run, work satisfactorily.

No. 2892, *The Melotte Separator Sales Company's* Cream Separator, the "Melotte," No. 5, fitted with turbine for driving with a jet of steam, price 27*l.* 10*s.*—The chief peculiarity of this machine is in the bowl being hung by a suspended rod (fig. 3), the lower end of which is formed into a hook and the upper end running in a ball-bearing, and being driven direct by a steam turbine. The effect of the suspension arrangement is that the bowl is free to take up such a position as to bring the centre of gravity vertically below the point of suspension, and on the central line of revolution, the result being that the driving mechanism is free from all strain that might be caused by eccentricity of centre of gravity of the bowl, and the power required, as well as wear and tear, are thus greatly reduced. The bowl itself (fig. 4) is fitted with a series of zigzag aluminium plates (fig. 5); these plates easily slip one inside another, forming a nest, it being practically impossible

for the attendant to put them in in their wrong order. While running, the bowl is enclosed in a cast-iron box, beautifully enamelled inside, which makes it very easy to clean. The turbine wheel itself has the appearance of a ratchet wheel, about $7\frac{1}{2}$ inches diameter and 1 inch thick, a jet of steam impinging on the teeth.

Owing to the position of the bowl the delivery of this machine is too low to be convenient, and will not admit of an ordinary milk churn being placed under it. It was understood that this was one of the first steam turbine machines that had been made by the Company, and doubtless the small alterations

FIG. 3.—The "Melotte" Cream Separator. Hook for suspending bowl.

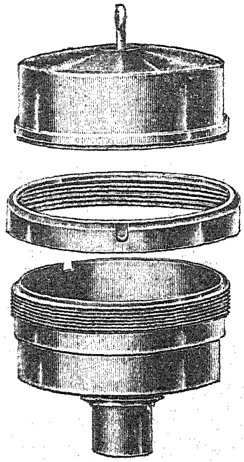


FIG. 4.—Bowl of the "Melotte" Cream Separator.

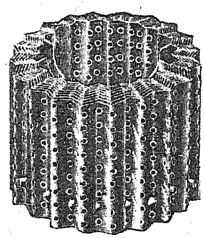


FIG. 5.—Zigzag aluminium plates in bowl of the "Melotte" Cream Separator.

in details that experience has proved to be advisable will be made in future machines.

This machine was somewhat unfortunate in the trial. Soon after starting a small amount of water from the exhaust of the turbine escaped and ran down over the bowl. Much difficulty also occurred with the governor controlling the supply of the milk to the bowl, as it failed to act properly, and dirty oil from the machinery, which in this machine is above the bowl, fell into the milk. This is a danger which will, no doubt, have to be guarded against in future machines, and provision made to prevent the possibility of the occurrence.

This machine was supplied with 280 lb. of milk, then heated to a temperature of 94° F. The bowl was driven at 6,500 revolutions per minute. The result of the working was as follows:—

	lb.
Weight of cream	$26\frac{1}{4}$
Weight of separated milk	$246\frac{1}{2}$
Left in drum	3
Loss	$4\frac{1}{4}$
	per cent.
Butter-fat in separated milk	0·241

No. 2546, *Watson, Laidlaw & Co.'s* Cream Separator, "Princess," steam turbine, price 32*l*. 10*s*., stand 32*s*. 6*d*. extra. —The chief peculiarity of this machine lies in a drum placed inside the bowl, which has a vertical axis, and is perforated with curved horizontal tubes, and appears to be built up of a number of annular plates having involute corrugations stamped thereon. Apparently these plates have been placed together so that the apices of the corrugations on one plate correspond with the apices of those of the plate next to it; they have then been sweated together, thus producing a series of involute tubes from the central space to the outside of the drum, and giving it the appearance of a cylinder honeycombed with tubes. This is a beautiful piece of construction, and as far as can be seen the tubes are quite clear of any unevenness or lumps of tin or solder, though, owing to their shape, it is impossible to see through them. The turbine is of the ratchet-wheel pattern, and is about $6\frac{1}{2}$ inches diameter by $\frac{5}{8}$ inch thick. The working parts of the machine are easily accessible, and the running is very smooth and quiet. The effect of the honeycomb arrangement in the bowl is a very rapid separation of the cream. The washing of the honeycomb drum is, however, a matter of some difficulty, and evidently takes more care and trouble than is likely to be expended upon it in ordinary work, whilst, owing to the curved form of the tubes, it is impossible to see whether they are clean or not. For the same reason it is to be feared that the tubes cannot be properly aired, which would be likely to lead to serious results in actual practice, as it is a common experience in dairy work that, although utensils may appear to be clean, unless they have been thoroughly well scalded and exposed to the air, the milk products that have passed through them, although showing no immediate effects, do not keep so well as they otherwise would.

This machine was supplied with 330 lb. of milk, which was delivered to the bowl at 89° F., the bowl being run at 8,000 revolutions per minute, with the following result:—

	lb.
Weight of cream	$42\frac{1}{2}$
Weight of separated milk	$281\frac{1}{2}$
Loss	6
	per cent.
Butter-fat in separated milk	0·185

The following table gives the result of the working of the three steam turbine machines exhibited for competition:—

STEAM TURBINE SEPARATORS.

Exhibitor	Capacity of machine	Price		Quantity of milk served out	Actual time running		Rate of delivery per hour	Weight of separated milk
	gallons per hour	£	s.	gallons	min.	sec.	gallons	lb.
Dairy Supply Co. .	110	31	0	36	20	30	105	325·5
Melotte Separator Sales Co. .	85	27	10	28	21	30	78·1	246·5
Watson, Laidlaw & Co. . .	100	32	10	33	21	0	94·3	281·5

Exhibitor	Weight of cream	Weight left in bowl	Butter-fat left in milk	Actual steam consumption during trial	Steam consumption per hour	Steam consumption per 100 gallons
	lb.	lb.	lb.	lb.	lb.	lb.
Dairy Supply Co. .	29·5	1·5	0·167	23·33	68·2	64·8
Melotte Separator Sales Co. .	26·25	3·0	0·241	19·8	54·78	70 7
Watson, Laidlaw & Co. . .	42·5	—	0·185	20 0	57·1	66·6

No. 3923, *The Dairy Supply Company's* "The Farmer's Surprise," No. 4, belt-driven, price 35*l.*—This machine, as were all the other belt-driven machines, was driven by an electric motor which derived its energy from a dynamo, so that the amount of power consumed was easily ascertainable. This separator is practically the same as the turbine-driven machine of the same exhibitors, differing only in the arrangements necessary for driving by belt instead of direct by turbine. It was, therefore, not adjudicated upon as a separate machine. It was supplied with 500lb. of milk, then heated to a temperature of 105° F., the bowl being run at 5,600 revolutions, with the following result:—

	lb.
Weight of cream	52½
Weight of separated milk	440
Left in drum	5½
Loss	2
	per cent.
Butter-fat in separated milk	0·139

No. 2545, *Watson, Laidlaw & Co.'s* Cream Separator "Princess," belt-power, price 55*l.*—This is a very large machine, being capable of separating 250 gallons per hour. Its size renders it more suitable for a central factory than a farm, as it would take the produce of about 200 cows to keep it going for an hour. It is fitted with a honeycomb drum similar to that of the steam turbine-driven machine, and is open to the same objection as to cleaning, &c.

No. 2567, *The "Fram" Dairy Machinery Company's* Cream Separator "Fram," No. 4, belt-driven, price 29*l.* 5*s.*—The bowl of this machine is driven by a cord from a large driving wheel to a small pulley on the bowl spindle, and is fitted with a very neat and simple arrangement for keeping the cord tight. Inside the bowl are fitted a number of flat aluminium plates, the milk being delivered to the outside of these through four tubes radiating from the central tube, into which the milk is fed. The bowl itself is self-emptying. The running of this machine was all that could be desired, and the power taken was extremely small. The absence of all noise and vibration was very marked. The working parts and liability to wear and tear are reduced to a minimum, but the separation was very unsatisfactory, the amount of fat left in the separated milk being very high. It is, however, understood that the patent arrangement fitted to the hand machine of these exhibitors, but which, unfortunately, met with an accident, is to be fitted to the power machines, and this may perhaps put matters right. This machine was supplied with 250 lb. of milk, then heated to a temperature of 90° F., the bowl being run at 4,500 revolutions, with the following result:—

	lb.
Weight of cream	40
Weight of separated milk	207
Left in bowl	nil
Loss	3
	per cent.
Butter-fat in separated milk	0·392

Class III.—Hand-power Separators.

The special object of these trials was not to ascertain the largest quantity of milk that a separator can possibly deal with efficiently when worked by manual labour, but rather to find the best machine which might be worked easily by a dairymaid. Consequently, a somewhat low limit was assigned to the amount of power for working them.

In this class the first hand-power machine to be tried was No. 2568, *The "Fram" Dairy Machinery Company's* No. 2, Hand-

power Separator, price 17*l.* 17*s.*, which has the same neat and ingenious driving arrangement as the power machine by the same makers. But, in place of the platinum discs in the bowl, it was supplied with an arrangement of metal gauze worked into somewhat the shape of a sunflower with eight petals, with a central rib of gauze down each petal, and, though it is difficult to follow out the effect of this, it was stated to work satisfactorily. At the trial, however, after it had been running for a short time it was noticed that something was wrong. Nevertheless the whole amount of milk was put through before stopping, and, on opening the machine, it was found that one of the divisions on the petals had become unsoldered and buckled, so that the machine was unfortunately put out of the running so far as these trials were concerned.

No. 2785, *Pond & Son's* Hand-power Cream Separator, "Crown," price 20*l.*—The bowl spindle of this machine is driven through a most ingenious and beautiful eccentric clutch arrangement, which is simplicity itself, and is illustrated in a subsequent report at p. 557. The effect is that the bowl spindle is free to overrun the driving gear, so that in the event of any accident, such as the attendant getting her apron or dress in the gear wheels, these are free to stop at once, and no harm would result, the bowl continuing to revolve with perfect freedom. The foot of the vertical shaft runs in a roller footstep with three balls. The bearing underneath the bowl is fitted into its place with a coil spring so as to give considerable elasticity, a useful feature, and one which lessens power and wear and tear. The outside gearing of this machine is somewhat noisy. The bowl of the machine is fitted with what is practically a three-sided, perforated inner bowl, the effect of which is to give excellent separation, but the power taken was considerable, being, in fact, in excess of the limit fixed by the Society. The bowl has a lid which is screwed on with an indiarubber ring as packing; this does not come into contact with the milk, but would probably be subject to a good deal of wear and tear. The revolutions of the handle are 47 per minute, giving a speed of 9,000 to the bowl. This machine was supplied with 170 lb. of milk, which was fed into the bowl at a temperature of 90° F. The result of the working was as follows:—

	lb.
Weight of cream	20
Weight of separated milk	144
Left in drum	$3\frac{1}{2}$
Loss	$2\frac{1}{2}$
	per cent.
Butter-fat in separated milk	0·097

No. 3924, The Dairy Supply Company's Hand-power Cream Separator, "The Farmer's Surprise," No. 1, 12*l.*—This machine is practically the same as this firm's power machine, with the bowl and conical plates on a smaller scale and the addition of gear for driving by hand. The vertical spindle has a seven-thread spiral cut upon it, which gears with a worm wheel on a shaft on which is a pinion gearing with a wheel on handle shaft. The revolutions of the handle are 50 per minute, giving a speed of 6,600 revolutions to the bowl. The running of this machine was remarkably light considering that it was driven through the medium of a spiral. The effect of the improvement in the internal fittings of the bowl is easily seen when the size of this machine, with an output of 45 gallons per hour, is compared with the old "Alpha Baby," which is of larger size and has an output of 33 gallons per hour. This machine was fed with 150 lb. of milk, then heated to a temperature of 100° F., the result being as follows:—

	lb.
Weight of cream	13
Weight of separated milk	134
Left in bowl	1
Loss	3
	per cent.
Butter-fat in separated milk	0·127

No. 2893, *The Melotte Separator Sales Company's* Hand-power Cream Separator, the "Melotte," No. 2, price 18*l.* 10*s.*—This machine has a suspended bowl similar to that of the power-driven machine, and is extremely light to drive. It is actuated by a bevel wheel on handle shaft, gearing into a bevel pinion on first vertical shaft, the necessary speed of the suspended bowl spindle being obtained through a clock-train. As will be seen from the illustration (fig. 6), this is well designed with no overhung wheels. The vertical spindle is in two parts, with a coil spring interposed, which gives an elastic drive to the bowl spindle proper. This latter is suspended from a ball-bearing. Careful provision is made to prevent oil from reaching the bowl. The governor for regulating the supply of milk to the bowl, which is similar to that of the power machine, worked well in this case. This machine was supplied with 150 lb. of milk, then heated to a temperature of 95° F., and the result of the working was as follows:—

	lb.
Weight of cream	12½
Weight of separated milk	135
Left in bowl	1½
Loss	1
	per cent
Butter-fat in separated milk	0·172

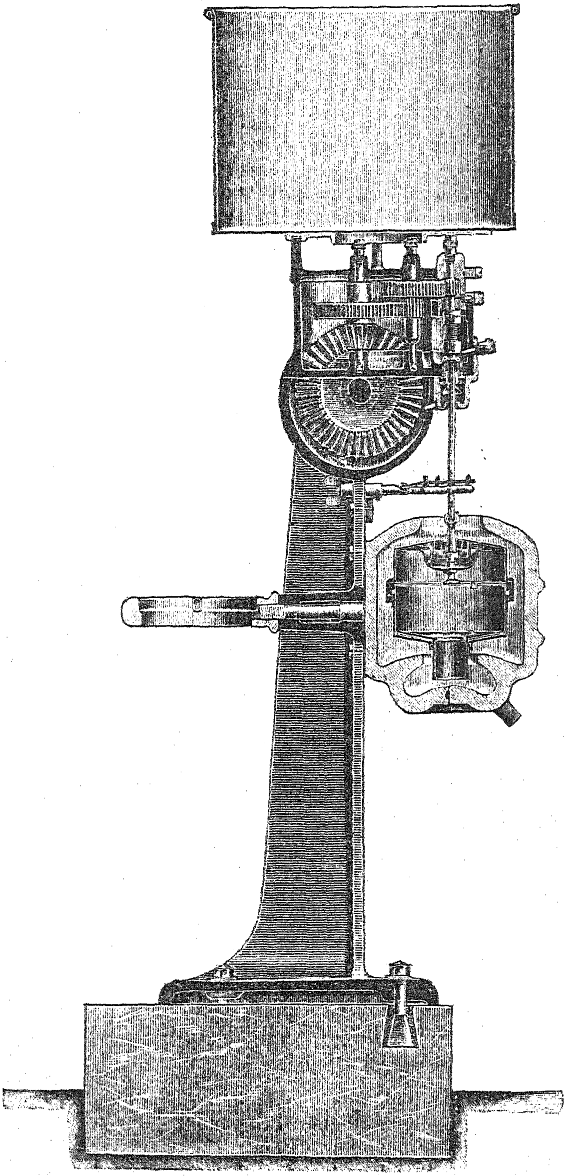


FIG. 6.—The "Melotte" Hand-power Cream Separator.

No. 2547, *Watson, Laidlaw & Co.'s* "Princess" Hand-power Separator, price 19*l.*—This machine has the same drum with involute tubes as their power machines, and the separation was better, but it is of course open to the same objections as to the difficulty of thoroughly cleansing the drum after use. The bearing under the bowl is held in its place by a flat indiarubber ring which projects beyond the brass, and out of the circumference of which semicircular pieces have been cut, so that the ring bears at intervals on the outside casing, thus giving the elasticity necessary. This machine is very substantially constructed, with well-cut gears. It was supplied with 170 lb. of milk, then heated to a temperature of 90° F., the speed of the handle being 56 revolutions per minute and that of the bowl 8,000. The result of the working was as follows:—

	lb.
Weight of cream	$19\frac{1}{2}$
Weight of separated milk	$147\frac{1}{2}$
Left in drum	$1\frac{1}{2}$
Loss	$1\frac{1}{2}$
	per cent.
Butter-fat in separated milk	0·133

No. 2548, *Watson, Laidlaw & Co.'s* "Princess Victoria" Hand-power Separator, price 12*l.*—This machine has similar driving gear to the last mentioned, but the bowl is different, being practically that of the well-known "Victoria" machine, but with spiral grooves at the bottom and giving higher discharge of the cream; the output, however, is very small compared with more modern machines, and the separation is not good. This machine was supplied with 80 lb. of milk, then heated to a temperature of 90° F., the speed of the handle being 56 revolutions per minute and that of the bowl 8,000. The result of the working was as follows:—

	lb.
Weight of cream	$14\frac{1}{4}$
Weight of separated milk	64
Left in bowl	1
Loss	$\frac{3}{4}$
	per cent.
Butter-fat in separated milk	0·260

No. 2549, *Watson, Laidlaw & Co.'s* "Victoria" Hand-power Separator, price 8*l.*—This machine is so well known as to require little description. Its small capacity and inefficient separation, compared with those of more modern machines, put it practically out of the running. It was supplied with 40 lb. of milk, then heated to a temperature of 90° F. The speed of the

handle was 56 revolutions per minute, and the bowl was run at 8,000 revolutions, with the following result:—

	lb.
Weight of cream	5
Weight of separated milk	34
Left in bowl	$\frac{3}{4}$
Loss	$\frac{1}{4}$
	per cent.
Butter-fat in separated milk	0·247

No. 2812, *Vipan & Headly's* Hand-power Separator, "Butterfly," No. 1, price 9*l.* 10*s.*, stand 20*s.* extra.—This is an ingenious machine, and it differs from all others entered for the trials in having a horizontal bowl, in which is fitted a metal plate arrangement with coned ends and two wings, from which probably the name "Butterfly" is derived. The outer bearing of the axle on which the bowl is fitted is surrounded with an indiarubber ring, which gives it the necessary elasticity, and the bowl is driven at the other end by three steel rings, each of which is driven by an internal disc wheel mounted on a stud on a revolving disc, which is fitted on the end of a second motion spindle, at the end of which is a pinion, gearing with a spur wheel driven by the handle. The three steel rings are also in contact with the inside of a large stationary ring concentric with the bowl shaft and second motion spindle, the whole making a species of frictional epicyclic train giving a high multiplication of speed, with very smooth and silent running.

In this machine the output is very small. It was fed with 50 lb. of milk, then heated to a temperature of 85° F., with the following result:—

	lb.
Weight of cream	6
Weight of separated milk	$42\frac{1}{2}$
Left in drum	$\frac{1}{2}$
Loss	1
	per cent.
Butter-fat in separated milk	0·182

No. 2813, *Vipan & Headly's* Hand-power Separator, "Butterfly," No. 2, price 11*l.*, stand 20*s.* extra.—This machine is similar to the last, except that it has 15 flat annular plates threaded on the spindle and connected by three webs or wings. The discs are about $\frac{5}{16}$ inch apart. The driving gearing is the same as in the "Butterfly" No. 1 machine, and, like it, ran easily and well; but it is interesting to note that the effect of the discs is that, while they largely increase the output of the machine, the separation is not so good as in the machine without them, as is shown below. This machine was fed with 90 lb.

of milk, then heated to a temperature of 85° F., the revolutions of the handle being 50 per minute, with the following result:—

	lb.
Weight of cream	$10\frac{1}{2}$
Weight of separated milk	$77\frac{1}{2}$
Left in drum	1
Loss	1
	per cent.
Butter-fat in separated milk	0·288

The construction of both these machines is exceptionally simple, and they are very quickly dismantled for cleaning purposes, &c.

In all the hand separators great attention has been paid to rendering it practically impossible for any accident to occur through any part of the clothing or hands of the attendant being caught in the gear wheels, so that even a Government inspector would find a difficulty in discovering any danger connected with their use.

The table on page 540 gives the result of the working of the machines in the Hand-power Class.

Commenting on the trials generally, it may be said that they show that finality has by no means been reached in the matter of separator design; but it seems clear that the day of the "empty" bowl machine has passed, as the various discs and plates that are placed in the bowls of the modern separators, when properly adjusted, appear to enormously increase their capacity. The cone plates of the "Laval," the vertical zigzag plates of the "Melotte," the involute tubes of the "Princess," and the triangular perforated inner bowl of the "Crown," all appear to have the same effect, though of course in varying degrees. In a collection of machines such as those put before the Judges there were, of course, good points to be found in every one, and, from the user's point of view, it seems a pity that the best points of the various machines cannot be taken and combined in one ideal separator. But probably patent rights and commercial reasons stand in the way of a consummation so greatly to be desired, though doubtless with increased experience and expiring patents we shall see still further improvements put on the market.

In these days of agricultural depression, the first cost of a machine is of course a matter of prime importance to a farmer. In order to facilitate comparison on this important point, the tables on p. 541 are given to show the cost price per 10 gallons declared to be separated per hour. The large power machines naturally show a lower price than the hand machines, as, besides

Hand-power Separators.

Exhibitor	Capacity of machine	Price	Quantity of milk served out	Actual time of running	Weight of separated milk	Weight of cream	Foot lb. per min.	Foot lb. for 10 gallons
		£ s. d.	gallons	min. sec.	lb.	lb.		
Dairy Supply Co., No. 3924	45	12 0 0	15	19 15	134·0	13·0	2,476	1,650
Melotte Separator Sales Co., No. 2893	45	18 10 0	15	20 20	135·0	12·5	1,680	1,120
"Fram" Dairy Machinery Co., No. 2568	44	17 17 0	15	Broke down in trial. Not tried for power				—
Pond & Son, Ltd., No. 2785	50	20 0 0	17	20 55	144·0	20·0	3,216	1,892
Watson, Laidlaw & Co., No. 2547	50	19 0 0	17	19 32	147·5	19·5	2,653 [1]	1,560
Watson, Laidlaw & Co., No. 2548	25	12 0 0	8	19 7	61·0	14·25	Not tried for power	
Watson, Laidlaw & Co., No. 2549	10	8 0 0	4	22 15	31·0	5·0	Not tried for power	
Vipan & Headly, No. 2812	16	9 10 0	5	20 37	42·5	6·0	2,432	4,864
Vipan & Headly, No. 2813	27	11 0 0	9	23 7	77·5	10·5	2,476	2,751

[1] This machine had not got up to its full speed at the commencement of the trial, consequently the power readings are probably too high.

what may be called the natural economy of a larger machine compared with a small one, a hand machine requires a more or less complicated train to obtain the high velocity required for the bowl consequent on the necessarily slow motion of the handle crank.

POWER CLASS.

No.	Exhibitor	Gallons separated per hour	Cost £	s.	d.	Prime cost per 10 gallons separated per hour £	s.	d.
3922	Dairy Supply Co.	110	31	0	0	2	16	$4\frac{1}{2}$ [1]
2892	Melotte Separator Co.	85	27	10	0	3	4	$8\frac{1}{4}$ [1]
2546	Watson, Laidlaw & Co.	100	32	10	0	3	5	0 [1]
3923	Dairy Supply Co.	150	35	0	0	2	6	8
2545	Watson, Laidlaw & Co.	250	55	0	0	2	4	0
2567	"Fram" Dairy Machinery Co.	75	29	5	0	3	18	0

[1] Including cost of turbine.

HAND-POWER CLASS.

No.	Exhibitor	Gallons separated per hour	£	s.	d.	£	s.	d.
2568	"Fram" Dairy Machinery Co.	44	17	17	0	4	1	$1\frac{1}{2}$
2785	Pond & Son	50	20	0	0	4	0	0
3924	Dairy Supply Co.	45	12	0	0	2	13	4
2893	Melotte Separator Co.	45	18	10	0	4	2	$2\frac{1}{2}$
2547	Watson, Laidlaw & Co.	50	19	0	0	3	16	0
2548	Watson, Laidlaw & Co.	25	12	0	0	4	16	0
2549	Watson, Laidlaw & Co.	10	8	0	0	8	0	0
2812	Vipan & Headly	16	9	10	0	5	18	9
2813	Vipan & Headly	27	11	0	0	4	1	5

In comparing the figures in the last column of the table for any two machines of the same class, allowance should be made for varying capacity, as, other things being equal, the machine with the larger capacity should show the lower cost.

The awards of the Judges, after taking into consideration the various points that have been detailed, were :—

CLASS II: 1st prize, 20*l.* Dairy Supply Co., Ltd. "The Farmer's Surprise," No. 3, steam turbine, price 31*l.* (No. 3922).
2nd prize, 10*l.* No award.

CLASS III: 1st prize, 20*l.* Dairy Supply Co., Ltd. "The Farmer's Surprise," No. 1, hand-power, price 12*l.* (No. 3924).
2nd prize, 10*l.* Melotte Separator Sales Co. "The Melotte," No. 5, price 27*l.* 10*s.* (No. 2893).

The thanks of the Judges are due to Mr. Courtney, the Consulting Engineer of the Society, whose courtesy, patience, and invaluable assistance went far to make the work of the

Judges a pleasant as well as an interesting task; also to Dr. Voelcker for the care he took in securing an even supply of milk for all the competitors, and for making a minute analysis of every sample submitted to him.

R. M. GREAVES.

Wern, Portmadoc.

NOTES BY THE SOCIETY'S CONSULTING CHEMIST ON THE EFFICIENCY OF SEPARATION.

In determining the awards in trials of cream separators great stress is very rightly placed upon the relative efficiency of the competing machines in doing the work they are intended for, viz. that of separating the cream from the whole milk. A special feature was made of this in the trials at Maidstone, and the general results are now placed on record. It may be well to point out that it is not enough to take a sample at random during the "run" of a machine, from milk of unknown quality, and, by analysis of the separated milk, to ascertain if there is much or little fat left in it. Cream separators have, generally speaking, been brought to such a state of perfection, and competition between them is now so keen, that nothing but well-arranged and exhaustive tests can be fully satisfactory. For the trials at Maidstone very complete arrangements had been made, and it may be claimed that these were carried out on lines perfectly fair to all the competing machines.

The milk to be used by the separators in any comparative "run" was measured out at the commencement, thoroughly mixed so as to be of uniform quality, and samples of it were taken by myself for analysis. From this uniform bulk the several lots, according to the requirements of the machines, were weighed out, and, after the "run" was over, the whole of the cream and of the separated milk was weighed back, the condition of the cream noted by the Judges, and samples of the separated milk drawn by myself and subsequently analysed. The quantity, if any, left in the bowl of the machines was weighed separately, and the loss of weight during the working duly noted.

It is well known that, according to the number of revolutions employed in a given time, it is possible, within limits, to make the separation more complete or less so, and it has not unfrequently happened that a competitor, in his anxiety to separate the quantity he has set himself to do in a given time, has sacrificed efficiency to quantity of out-turn, while, if he has had an idea that the products would be analysed as regards

completeness of separation, he has turned his attention to this point mainly, and neglected the consideration of out-turn. The competitors in the two classes were therefore distinctly told that the two points would at each "run" be taken into account, that samples might be taken at any period, and that the decision would rest upon the efficiency of separation when the machines were doing the amount of work which they had been announced to be capable of doing.

CLASS II.—POWER MACHINES.

The first "run" of the six competing machines, at which samples of the separated milk were taken for analysis, was on Wednesday, June 14. Three machines were run on the morning of this day, and the other three in the afternoon. The whole milk used on these occasions showed on analysis :—

Wednesday morning .	Percentage of fat .	3·19
" afternoon .	" " .	3·27

Thus the two lots were practically alike in quality.

The samples drawn by me from the whole yield of separated milk from each individual machine were subsequently analysed and gave the following results :—

No. in catalogue	Machine	Percentage of fat left in separated milk
3922	Dairy Supply Co., No. 3 (turbine)	0·167
2892	"Melotte," No. 5 (turbine) . .	0·241
2546	Watson, Laidlaw & Co. (turbine) .	0·185
3923	Dairy Supply Co., No. 4 . .	0·139
2545	Watson, Laidlaw & Co. . .	0·208
2567	"Fram," No. 4	0·392

The first three machines, it will be noted, were driven by steam turbine, the others were ordinary power machines worked by belt-power. The two machines of the Dairy Supply Co. effected the most perfect separation, and the turbine of Watson, Laidlaw & Co. came next. The "Melotte" (turbine) did not give nearly such good separation, and distinctly the worst of all in this respect was the "Fram" machine. The last named, indeed, gave very inferior separation, a result due, doubtless, in great measure, to the hurried alterations which the exhibitors had had to make in the arrangement of discs in the bowl of their machine. It was explained that the mechanism had received some damage shortly before the trial commenced, but, however this may be, the machine worked very imperfectly in regard to the separation effected.

Later on, when the Judges, after selection of No. 3922 for award, and eliminating the other machines, ordered a further trial of the "Fram" machine, to assure themselves as to its efficiency or otherwise in regard to separation, a sample of the separated milk then taken gave:—

Percentage of fat . . . . . 0·343

Thus it was clear that the machine exhibited effected very imperfect separation, and the first trial was confirmed.

Class III.—Hand Machines.

The nine competing machines were all given a "run" on Thursday, June 15. The whole milk used for the machines showed on analysis:—

Percentage of fat . . . . . 3·39

Samples were drawn by me from the whole yield of separated milk from each individual machine and subsequently analysed, when they gave the following results:—

No. in catalogue	Machine	Percentage of fat in separated milk
2568	"Fram," No. 2	0·928
2785	Pond & Son	0·097
3924	Dairy Supply Co., No. 1 . .	0·127
2893	"Melotte," No. 2	0·172
2547	Watson, Laidlaw & Co. . .	0·133
2548	" " " . .	0·260
2549	" " " . .	0·247
2812	Vipan & Headly "Butterfly," No. 1	0·182
2813	" " " No. 2	0·288

A considerable amount of difference, comparatively speaking, was accordingly shown between the several machines. The most perfect separation was that effected by the machine No. 2785 of Pond & Son, and though, on other grounds, the machine did not get an award, its efficiency in separating calls for note, as this was the machine that gave the least fat in the separated milk. The Dairy Supply Co.'s No. 1 gave a very good result also, as did one machine of Watson, Laidlaw & Co. The separation effected by the "Melotte," though good, was inferior to that of its near rival, the Dairy Supply Co.'s No. 1 machine. As in the "Power" class, the "Fram" machine gave very bad working, and there was, clearly, something amiss with the separating mechanism of this machine, which did not, after this, take further part in the competition.

As the trial continued it resolved itself into a contest between the Dairy Supply Co.'s No. 1 machine (3924) and the "Melotte," No. 2 (2893).

It was then thought by the Judges advisable to again test the relative efficiency of separation in the case of these two machines, and samples of the separated milk from a further "run" on Monday, June 19, were taken and analysed. The results were:—

	Percentage of fat.
No. 3924, Dairy Supply Co.'s No. 1	0·101
,, 2893, "Melotte," No. 2	0·129
The whole milk used containing	3·190

On this occasion the separation was, with either machine, better than at the first trial, but the Dairy Supply Co.'s machine again showed its superiority. The figures obtained here were exceedingly satisfactory, and showed the perfection to which these hand separators have now been brought. A comparison with the results in the former competition held at Doncaster in 1891 may possibly lead to the belief that the results now recorded are not as good, on the whole, as those obtained in the Doncaster Trials. (Compare Journal R.A.S.E., 3rd series, vol. ii., 1891, p. 519.) It must therefore be explained that this is not the case, but that the methods of chemical analysis for separated milk have been meantime rendered more perfect, and there is little doubt that the figures given in the Doncaster trials were better than the fact; also, it is more than probable that the fat in the separated milk was not so fully extracted then as we are now, by improved methods, able to effect. The present results with the successful machines show, indeed, an improvement on what was done before, and they are highly satisfactory.

J. Augustus Voelcker.

13 Hanover Square, W.

THE TRIALS OF HOP-WASHING MACHINES AT MAIDSTONE.

The hop plant is specially susceptible to the attacks of insect pests. These, if left undisturbed, multiply so fast as to cause a "blight" on the hops. The "vermin" continue to suck the juice of the plant until the leaves turn black and fall off, and the end is the total destruction of the crop. It is the aim of

the hop-grower to kill this blight by the quickest and best means in his power, and this is now done by the aid of a water-tank on wheels drawn by horses, the wheels working internal pumps, which force an upward shower-bath of liquid insecticide on to the under side of the leaves, where the "lice" congregate, the insecticide being one which is fatal to the lice and not injurious to the plant.

In these days of persistent blight on growing hops—from which, however, this year we have been comparatively free—a good washer is most necessary, and it is impossible to grow a clean crop of hops without its help. To the hop-grower, therefore, the choice of a washer is a most important matter.

The essentials of a good washer are that it does not draw too heavily on one's pocket in purchasing, nor on the horses' strength in working; that it is not too complicated, nor liable to get out of order; that it is not beyond the capacity of the average agricultural labourer to quickly alter it to suit the many and varied ways in which hops are now trained. Furthermore, it should be capable of sending a fine spray or mist without too much force on the young and tender plant in its early growth, or of directing a much more heavy spray to dislodge the insects which, late in the season, make for the tops of the plant, where the vine is often thick and "housey,"—also of distributing a large or small quantity of liquid as required on the plant, with the least delay and trouble in altering.

With these essentials in view, we proceeded on June 16, 1899, to test the working of the seven machines entered for competition, of which two were steam pumping machines forcing the liquid through a series of iron pipes laid along the ground, with branch pipes of indiarubber, and nozzles directed by manual labour on to the hop plant. These were entered by Messrs. Arnold & Son of Tonbridge, and Messrs. Merryweather of London, and, although doing their work very well, were not considered suitable for the average hop-grower on account of the heavy initial outlay, and of requiring a number of trustworthy men to work them, which put them out of the competition with the horse machines.

The trials took place at 9.30 A.M., in Mr. W. Chambers's gardens, Shepway Court, Maidstone, where the hops were all growing on the Butcher system of training. In the afternoon the three machines selected for further trial were worked in the adjoining gardens of Miss McCulloch, Gould's Court, on a combination of poles and string.

As the trials took place rather early in the season, the hops were not sufficiently advanced to show the full capabilities of the

machines on the leaves and vine of the plant. We therefore had to judge by the manner in which they sent the spray, the quantity projected, and the direction and height to which it was forced. Note was also taken of the horses' draught, and the ease with which the machines were altered to suit the different methods of training the hop plant.

Five horse machines were entered for trial:—

Two by Messrs. Drake & Fletcher, Maidstone.
One by Messrs. Weeks & Son, Maidstone.
One by Messrs. Lambert & Son, Horsmonden.
One by Messrs. Tett, Faversham.

Of these, one of the machines of Messrs. Drake & Fletcher was withdrawn as being less powerful than the one kept in for competition, and after the first trials the machine of Messrs. Tett was discarded as not being equal to any one of the remaining three in power and quantity of liquid used.

The machines were run up and down the alleys under the same conditions, first with full jets on, and then with some turned off, so as to show the effect of washing a heavy or light quantity of vine.

After these trials the three machines were tried against a screen to show the pattern and amount of space covered by the spray, but owing to the high wind which was blowing the effect was not good.

In the afternoon the three selected machines were further tried in the adjoining gardens of Miss McCulloch, on a different arrangement of poles and wire, after which the machines were run up and down in the open with full speed and power on, so that it could be better observed to what height and width the spray would go, and the quantity of liquid that could be used.

The three machines were tried in all ways and under every condition of hop growing, and *all came well out of the trials.* We decided, however, that Messrs. Drake & Fletcher's "Mistifier" (No. 1262) was the best machine for practical hop washing, for all systems of poling or stringing, and under all conditions of growth. Our decision was endorsed on the following day by the result of the Consulting Engineer's trials, after which we had the pleasure of awarding the Prize of 50*l.* to Messrs. Drake & Fletcher for the best machine for washing hops with liquid insecticides.

MONTAGU C. H. TAYLOR.
WILLIAM CHAMBERS.

NOTES BY THE SOCIETY'S CONSULTING ENGINEER ON THE COMPETITION OF HOP-WASHING MACHINES AT MAIDSTONE.

For the awards offered by the Society for a "Machine for Washing Hops with Liquid Insecticides, to be worked by Horse Power or Mechanical Power," there were seven entries by six competitors, viz.—

No. in Catalogue.	Names and Addresses of Exhibitors.
292	Merryweather & Sons, Ltd., Greenwich Road, S.E.
434	W. Arnold & Sons, Tonbridge.
1191	W. Weeks & Son, Ltd., Maidstone.
1254	W. Lambert & Son, Horsmonden, Kent.
1262	Drake & Fletcher, Maidstone.
1263	" " "
1296	Henry S. & F. Tett, Faversham.

Of these the first two were steam machines, the others horse machines.

Messrs. Merryweather & Sons' plant, No. 292, consisted of one of their "Valiant" pattern steam pumping-engines, the engine being mounted on one of their fast-steaming boilers.

A light four-wheeled van is provided for carrying the whole of the apparatus, consisting of steel main distributing tubes, branch pipes, spray tubes, hose reels, tanks for mixing the insecticide, &c., while the engine and boiler are mounted on a two-wheeled removable carriage, which may be attached to the rear of the van.

In the design of this appliance extreme portability and lightness have been a first consideration, and consequently the weight of the whole plant is stated to be only 34 cwt., the weight of the engine and boiler alone being $6\frac{1}{2}$ cwt.

The main distributing pipes are $1\frac{1}{4}$ inch diameter, of galvanised steel, fitted with necessary tees and connections for the several lengths of hose leading to the spray tubes. These spray tubes are of $\frac{3}{4}$-inch drawn steel, with cocks at the lower end for regulating the spray.

It is claimed for this system of washing that the plants may be more perfectly washed with the expenditure of very much less fluid than is the case with horse machines, and that, although it may take a little time to lay the pipes about the hop garden, yet the work can be done at a less cost than with horses.

A trial took place on Mr. Chambers's ground before the Judges (Mr. Wm. Chambers, Southfleet, Gravesend, Kent, and Mr. M. C. H. Taylor, Shelsley Walsh, Worcester), who were unable to endorse all the claims put forward by the manufacturers.

Messrs. W. Arnold & Sons' plant, No. 434, consisted of an ordinary 8 h.p. portable engine and boiler, upon which in front of the smoke-box were mounted two direct-acting simplex pumps.

One of these pumps takes its suction from a pond or other source of water supply and delivers it into the tank in which the insecticide solution is prepared. The other pump takes its suction from this tank and delivers through iron main pipes to the hop garden, where the solution is distributed by means of hose to the several sprayers. The pumps delivered at the rate of about 1,250 gallons per hour, and were capable of working ten jets with a pressure of about 50 lb. at the sprayer.

The special feature of this plant is that the engine and pumps are placed close to the source of water supply, forming, as it were, a central pumping station, where one man can attend to the working of the engine and mixing of the insecticide, and all expense in the way of cartage of water, which is frequently a very serious matter, is done away with.

For large orchards or hop gardens no doubt the plant would pay for itself, but for the smaller grower the expenditure is too heavy.

The remaining five machines competing were very similar in general design. A wrought-iron tank of approximately eighty gallons capacity is mounted on wheels, and inside the tank are a set of pumps actuated by gearing from the travelling wheel axle, which pumps deliver through a series of pipes and jets, the arrangement of which to suit the various methods of training hops and give the most efficient spraying constituted the main differences in the machines.

As it is necessary to vary the amount of insecticide used for different washings, provision for this is made in two of the machines—viz., Messrs. Drake & Fletcher's and Messrs. Lambert & Son's—with the usual change gearing for working the pumps either at a fast or slow speed. In the others regulation was effected by the jets or valves.

Messrs. Drake & Fletcher's machine, No. 1262, is fitted with the usual change gearing for working the pumps at a fast or slow speed, the one being about one-half of the other; in addition to this the nozzles may be reduced in area by simply screwing them down, and a relief valve on the delivery returns any excess fluid pumped back to the tank.

The second machine by Messrs. Drake & Fletcher, No. 1263, was similar to the above, but with 2-throw instead of 3-throw pumps. This machine was withdrawn from trial

by the exhibitors, who preferred competing with the larger machine.

Messrs. W. Weeks & Son's machine, No. 1191, has only one speed for the pumps; but different forms of jets are used, and the relief valve is adjusted to a greater or less pressure.

Messrs. Lambert & Son, No. 1254, use fast and slow gear, giving a difference of about two-thirds in the rate of delivery; the jets are each controlled by a valve, and there is the relief valve as in the other cases.

Messrs. Henry S. & F. Tett's machine, No. 1296, had pumps also of the 3-throw type; in working, however, the arrangement of the jets was not found to be satisfactory.

The Judges, having made the trials described in their report, selected three machines, viz.:

No. 1262, Messrs. Drake & Fletcher,
„ 1191, Messrs. W. Weeks & Son,
„ 1254, Messrs. W. Lambert & Son,

for further trial to test their comparative draught and their pump capacity. Table I. gives the particulars of these machines:—

TABLE I.

Name of Competitor	Drake & Fletcher	W. Weeks & Son	W. Lambert & Son
Catalogue No.	1262	1191	1254
Weight of machine empty	11c. 2q. 14lb.	12c. 0q. 21lb.	11c. 2q. 11½lb.
Maximum capacity of tank	84·7 gall.	81 gall.	82 gall.
Size of pumps, 3-throw	3″ dia., 4″ stroke	3″ dia., 4·6″ stk.	2⅝″, 4·5″
Diam. of travelling wheel	3′ 0″	3′ 0″	2′ 11″
Ratio revs. of pumps to travelling wheels	Fast 61 : 21 Slow 95 : 55	Fast 53 : 21 —	Fast 64 : 28 Slow 69 : 23

To test the draught, each machine was attached to a traction dynamometer and drawn over a distance of 200 yards, instructions being given to maintain as nearly as possible the same speed as when working in the hop garden. This, no doubt, was somewhat exceeded, as it was found impossible to work the dynamometer in the rough and narrow alleys between the hops, and the easier going on the grass conduced to rather faster travelling.

The draught recorded on the smoother grass surface is less than the working draught in a hop garden would be, but is comparative for each machine.

Table II. gives the results of these trials.

TABLE II.

Name of Competitor	Drake & Fletcher	W. Weeks & Son	W. Lambert [& Son
Catalogue No.	1262	1191	1254
Distance travelled	200 yards	200 yards	200 yards
Approximate speed	3 miles per hour	3 miles per hour	3 m. per hour
Revs. of driving wheel per min.	28	28	28·8
Revs. of pumps, fast speed	81·2	70·6	86·4
Theoretical delivery	24·6 gall. per min.	24·6 gall. per min.	22·18 per min.
Actual weighed delivery	15·7 „	10·0 „	12·1 „
Gallons per acre at same delivery as preceding column, and assuming rows 6′ 3″ apart	414	264	319
Draught in lb.	318	281	377·5

It will be noticed that in each case the actual delivery from the jets was very materially less than the capacity of the pumps at the speed at which they were working. This was due to over-anxiety on the part of the competitors to obtain widely diffused jets, and as a consequence the balance of the water was returned to the tank through the relief valve, and represents so much loss of power.

By putting a pressure-gauge on one of the jets the pressure indicated was found to vary from 80 to 120 lb. Taking the mean at 100 lb., and assuming the pumps to deliver at the rate of twenty gallons per minute, this represents considerably more than the work of one horse, and accounts for the heavy draught of the machines, more especially as noticed when at work among the hops, and suggests the question whether a self-propelled machine with fast and slow speed could not be contrived at a moderate cost and weight to supersede horse power.

F. S. COURTNEY.

Broad Sanctuary Chambers, Westminster, S.W.

MISCELLANEOUS IMPLEMENTS EXHIBITED AT MAIDSTONE.

THE county of Kent is peculiar in several of its agricultural features, and notably in the large acreage which it devotes to the cultivation of hops. The circumstance that at the Maidstone Meeting special prizes were offered for hop-washing machines no doubt caused the attention of local manufacturers to be concentrated on these appliances. Moreover, the flourishing condition of the engineering trade throughout the country, which was brought to our notice again and again through the declared inability of exhibitors to deliver any special article within a reasonable time, demonstrated that makers were too busily employed in the carrying out of orders on hand to enable them to devote their attention to experimenting on new departures.

These considerations probably account also for the lack of anything very remarkable in the way of novelties, although certain improvements and developments were noticeable which are mentioned later on. A little disappointment was felt that motor vehicles were so poorly represented—there being but three exhibits, and only one entered as a new implement. It might have been hoped that as a result of last year's trials, and in view of the special importance of labour-saving machinery to-day, it would have been possible to record important improvements in this direction. A somewhat remarkable feature of many of the stands was the number of articles of foreign manufacture—chiefly American—which gave the impression that some of our leading firms were becoming Implement Agents rather than Implement Makers. It is to be hoped that the latter will endeavour to retain the old name, instead of allowing themselves to be supplanted with the manufactures of our Transatlantic cousins, though it cannot be denied that these possess very great merit.

SILVER MEDAL AWARDS.

There were 49 entries for Silver Medals offered by the Society for "new implements" for agricultural or estate purposes. After a careful inspection of them we recommended the award of the medals to the four following exhibits, which are here noticed in the order of the Catalogue.

Article 2894.—*The Melotte Separator Sales Company,*

Counterslip, Bristol. "Melotte" Cream Separator, No. 5 (capacity, 85 gallons per hour). Price 29*l.* 10*s.*—This is a novel form of separator, the principal feature being the suspension of the separating bowl from the lower end of a vertical spindle. The bearing of this spindle takes the form of a ball socket, and the power is transmitted to it through a spiral spring. On starting, the bowl appears to run "out of true," but on attaining speed it quickly steadies itself and rotates with perfect evenness, after the manner of a gyroscope. The gearing takes the form of a horizontal clockwork train, and is entirely enclosed. Our award of the Society's Silver Medal was "for the arrangement of driving the bowl by means of a suspended spindle running on balls."

Article 3924A.—*The Dairy Supply Company, Ltd.*, Museum Street, London, W.C. Cream Separator "Farmer's Surprise," No. 2 (capacity, 100 gallons per hour). Price 26*l.* 10*s.*—This machine is an improvement of the well-known "Alpha Laval." The model is practically the same; the improvement is involved in the introduction of the new milk down the whole length of the bowl, and at the point where the specific gravity of the new milk is equal to that of the milk already in the bowl, thereby reducing the disturbance caused by the entry of the milk and increasing the rapidity of separation through evading the necessity for the inflowing milk to pass through the wall of cream found near the centre of the bowl and re-mixing part of the separated milk. This is what takes place in the old type, where the milk passes into the bowl near the centre. Our award of the Society's Silver Medal was for "the arrangement of a centre tube in the bowl of a separator fitted with the Alpha Patent discs in such a manner that the incoming milk is delivered along the whole depth of the bowl."

Article 4164.—*The Barton-Gillette Horse Clipping and Sheep Shearing Company, Ltd.*, 103 New Oxford Street, London, W.C. Pedal-power Sheep Shearing Machine combined with Knife Grinder. Price 14*l.*—Sheep shearing machines have been before the public for some considerable time, and owing to the labour difficulty of the present day a satisfactory machine would be particularly acceptable to flock owners. The improvement for which the Society's Silver Medal was awarded consisted of the introduction of a ball race between the upper and lower plates of the clipper head, which minimises the severe friction due to the great speed it is necessary to drive the plates to cut through wool (3,000 strokes per minute). The difficulty experienced with the old form of clipper was over-heating, which necessitated either changing knives or frequent cooling in water.

We gave this machine a fair trial in the yard, in the presence of two eminent sheep owners. Two sheep were shorn in six minutes, and the work was considered to be satisfactory in all respects, the clipper hands practically remaining quite cool. The ball race is simply constructed and easily fixed. There are also a few minor improvements tending to increased efficiency, and also to simplification of repair and renewal of working parts.

Article 4170.—*Alfred Hetherington & Co.*, Wey Iron Works, Alton, Hants. Roller Floor for Hop Kiln. Price 37*l.*—This arrangement is designed for the twofold object of saving labour and of minimising injury to the hops in the process of drying. It consists of a drying floor constructed of horsehair, arranged to wind over a roller fixed at the front of the kiln. The roller is actuated by a system of winches. The hops are spread over the surface of the roller floor, and the subsequent manipulations are performed from a travelling trolley or gantry, running at a convenient distance above the floor, all parts of which can be easily reached from it. When it is desired to "bag" the hops the floor is wound on to the roller, and the hops fall into bins, at the folding edge, in as whole a condition as they went on to the floor, a brush being arranged to clean the hops off the floor during the process of rolling. A full description of this roller floor, with an illustration showing a cross-section through the floor from back to front of kiln, will be found on pages 50, 51 of the preceding volume of the Journal (3rd series, vol. ix., 1898, part i.), so that it is not necessary to refer to it here in further detail.

In considering the merits of this appliance we had the advantage of the assistance of the Judges of Hops, who gave their opinion that it was a valuable adjunct to the modern hop kiln.

Other Miscellaneous Implements.

I propose to give a short description of a few of the other miscellaneous implements, taking them as before in the order of the Catalogue.

Article 226.—*George Frederick Zimmer*, 82 Mark Lane, London, E.C. "Kreiss" patent Swinging Conveyor. Price 8*s.* to 13*s.* per foot, according to length.—This consists of troughing adapted to convey any material, such as grain, minerals, artificial manures, &c. It is claimed that a 12-inch trough will pass ten tons of ore per hour. The trough is carried on laminated springs, which are slightly inclined in the

opposite direction to that in which the material is to travel, a quick reciprocating motion being imparted to the trough by a crank.

The British Preserving Company, Rayne, Essex, exhibited at Stand 52 an assortment of dried fruit, vegetables, herbs, &c. Their special process is the successful extraction of water without burning or drying up the fibres and tissues, in order that the materials treated may re-hydrate and assume almost their normal size, and retain a great deal of their natural aroma and colour. This problem the company seems to have solved most satisfactorily, as the colour of such specimens as beetroot, parsley, &c., was most remarkable. The process is no doubt a valuable one for such purposes as an army in the field, a long sea voyage, or exploring expeditions, &c., necessitating the conveyance of baggage in the smallest possible bulk.

Article 438.—*Blackstone & Co., Ltd.*, Stamford. Swath Turner. Price 17*l.*—This machine, like the older one made by this firm, is of the kicker type, the tines working at an angle to the line of direction. The mechanism is simple and ingenious; the turning forks are connected to the opposite ends of an oscillating beam, which works at an angle to the driving axle, giving the forks their vertical motion. The horizontal motion of the forks is obtained by connecting each of them with rods, at suitable distances for their point of suspension, to two of the pins of a three-throw crank. The third pin of this crank is joined by a connecting rod to the beam, and causes it to oscillate. These two motions, combined with the forward motion of the machine, result in the efficient turning of the swath by the tines.

Article 758.—*E. & H. Roberts*, Deanshanger Iron Works, Stony Stratford, Bucks. Windmill and Pump, "Hercules." Price 47*l.* 10*s.*—This mill contained an extremely neat device for utilising two-thirds of the power in forcing the water up, and one-third in filling the pump. It is attained by utilising the time-honoured "quick return" action, as fixed to most modern shaping machines.

Article 841.—*Charles Burrell & Sons, Ltd.*, Thetford, Norfolk. Steam Road Roller ($12\frac{1}{2}$ tons), fitted with Hossack's patent scarifier. Price 515*l.*—The scarifier attachment is constructed of cast steel of great strength. It consists of a triangular frame pivoted on the main axle and enclosing the lower portion of one of the driving wheels. The tools are fixed in a heavy tool box at each end of the frame, which is rocked by tangent screw and connecting links, as may be required to suit forward or backward motion of the engine. The apparatus was not tried by us,

as it hardly appeared to be of general use for "agricultural or estate purposes," though it seemed to be admirably adapted for the purposes of highway authorities.

Article 866.—*The Darby Land Digger Syndicate, Ltd.*, 6 Billiter Street, London, E.C. Land Digger. Price 350*l.*—This well-known implement has undergone considerable alteration in design; the kicker forks have been dispensed with, and revolving steel discs take their place. It is claimed that the land is more thoroughly disintegrated, and at a greater speed, whilst the apparatus folds up to a certain extent to admit of passing through ordinary fixed gates. The implement was not tried by us in actual work, in view of the proposed trials of cultivators and diggers announced to take place at the York Meeting next year.

Stand 158.—*Richmond & Chandler, Ltd.*, Manchester.—This firm have made an alteration in their chaff-cutting machines. They now substitute a live roller for the first of the four idle rollers used for pressing the material in the feed-box. It is claimed that by this device the liability to choke is reduced.

Article 2194.—*Barford & Perkins*, Peterborough. New Combined Portable Boiler and Steamer. Price 11*l.* 10*s.*—This exhibit consists of a covered cauldron seated on a fire-box. The cauldron is raised and made to swing clear of the fire by means of a raising lever applied to trunnions. The cauldron can be held in any desired position for filling or emptying. The material to be cooked rests upon a convex plate at the bottom, leaving room for a quantity of water next the fire. From the apex of the plate a perforated tube is led vertically through the centre of the cauldron, disseminating steam through the mass, which ensures evenness in cooking, and also expedites that operation.

Article 2575.—*Walter L. Bourke*, The Old Hall, Worsley, Lancashire. Cooler for Milk or other Liquids (vertical pattern), manufactured by Dairy Outfit Company, London. Price 8*l.*—This apparatus consists of two cylinders, one fitting inside the other, having an annular space between the two to form a chamber for the milk. This space is closed, top and bottom, by flanges packed with rubber rings; the whole is held in position by suitable wing nuts. Perforated tubes are fitted round the top, through which sprays of cold water are thrown on both sides of the chamber. The milk enters the annular space at the bottom, and passes out (cooled) at the top. The advantages claimed are: (1) greater efficiency in cooling; (2) protection of the milk from external influences in process of cooling;

(3) simplicity of cleaning. The apparatus was tried in the Dairy, and gave satisfactory results. Some small defects of construction were apparent, but these are capable of remedy, and it may become a useful adjunct to the dairy appliances. The

FIG. 2.

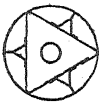
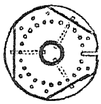


FIG. 3.



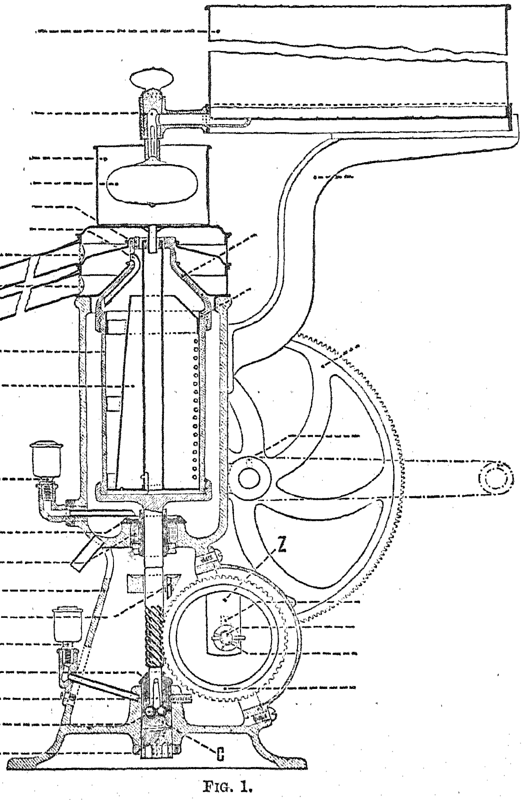


FIG. 1.

POND & SON'S HAND-POWER CREAM SEPARATOR.

FIG. 1.—Sectional elevation, showing 3-sided perforated inner bowl.
FIGS. 2 and 3.—Horizontal sections through upper and lower portions of inner bowl.

principle of the invention, however, is not an entirely novel one.

Article 2785.—*Messrs. Pond & Son, Ltd.*, Blandford, Dorset. "Crown" Cream Separator, manufactured by Svenska Centrifug, Stockholm. Price 20*l.*—This separator (figs. 1, 2, 3), which has previously been noticed at p. 534, has a very pretty and ingenious

friction pawl, introduced between the worm wheel and the bowl spindle, which slips immediately the bowl overruns the speed of the driving handle. The arrangement is shown at z in fig. 1.

Article 2901.—*Garrett, Saveall, & Co.*, Medway Iron Works, Maidstone. Milk and Fruit-boiling Apparatus, manufactured by R. & W. Wilson & Sons, 90 Wardour Street, London, W. Capacity, 30 bottles. Price 2*l.* 12*s.*—The novelty of this apparatus consists of the method employed in hermetically sealing the bottles at a high temperature. A rubber ring is fitted in a groove round the bottle neck; a metal capsule is placed over the mouth of the bottle resting on the rubber ring, and kept in place by a spring clip, which permits the heated vapour from the bottle to escape without displacing the capsule. On cooling down, a vacuum is formed, which draws the capsule into place, and so forms an air-tight joint. The various samples shown to us had a most pleasing appearance, and it was claimed that they would keep for years in that condition. I have personally tested this apparatus since the Show, and find it most satisfactory in every way. It is particularly simple and easy to manipulate.

The *South-Eastern Agricultural College*, Wye, Kent, had a stand (No. 360) full of interesting and instructive exhibits, including sections showing the characters of the chief soils in the counties of Kent and Surrey; models of the various methods of training hops; samples of manures, insecticides, &c. They also exhibited specimens of young fruit trees, showing the effects of summer and winter pruning, root pruning, and so on. They had a large and extremely interesting collection of horse shoes, from specimens of the earliest date, crude and rough in design, down to the most modern and special purpose shoes of to-day.

I cannot conclude this short report without acknowledging the indebtedness of my colleague, Mr. Charles P. Hall, and myself to the Stewards of Implements for the trouble they took in making the necessary arrangements for the conduct of our duties; to Mr. F. S. Courtney, the Society's Consulting Engineer, for his invaluable advice; and to the exhibitors, who were always ready and willing to afford every information and facility during our visit of inspection.

BAYNTUN HIPPISLEY.

Ston Easton Park, Bath.

Official Reports.

THE EARLY FEEDING OF MANGELS TO STOCK.

In general farm practice, when turnips and swedes are fairly abundant, it is not usual to commence giving mangels to stock until the new year has been entered upon, by which time the mangels, which have been stored meanwhile, are considered to be fit for feeding purposes. Moreover, there is general support given in practice to the belief that mangels, if fed early, say before Christmas, are apt to do harm to stock, causing "scouring" if fed at all freely, whereas these injurious properties pass off if the roots be stored and only fed at a later date. There are, however, some agriculturists who make a practice of feeding mangels early to stock, especially to dairy cows, and maintain that, if this is done judiciously, mangels may be fed quite well and profitably from the time of taking up the crop. Again, in the case of failure of the turnip crop, it may be that the farmer finds himself obliged to begin feeding his mangels earlier than he ordinarily would do.

Such was the case in the winter of 1898–9 at the Woburn Experimental Farm; there was a very short crop of swedes, but a very good one of mangels. The circumstances, accordingly, were such as to make desirable a trial of the early feeding of mangels to stock.

In connection with this question it has to be borne in mind that perhaps no factor is so important as is the influence of season in determining the relative state of maturity reached by root crops, and whilst the conditions of one season may lead to the production of a more or less immature root, those of another may result in a fully matured crop. Thus it does not follow of necessity that the early feeding of mangels will be attended by the same difficulties in one season as in another. The year 1898 was, in the Midlands at least, an exceptional season for the perfect development of mangels, for, whereas the absence of rain in September caused the swede crop to be nearly burnt up, the mangel crop, already well established, was enabled to mature well, so that when it was pulled it was a perfectly ripened crop. This was the result of the steady transference to the root of [illegible]d constituents elaborated by the leaves, and of the storing up of the same in the root without any of that second growth of leaf which continued rainfall in September might have

occasioned, and which would have resulted in the production of a more or less immature root.

It might be assumed, then, that the early feeding of mangel in such a season as 1898-9 would be less likely to be attended by risk than ordinarily.

The mangels grown were "Golden Tankard," and the first lot was pulled on October 11 and pitted; the second lot was taken up on October 27 and 28, and the last lot on November 13.

The line upon which it was determined that the experiment should proceed was that of giving mangels to fattening bullocks along with an ordinary diet of cake, corn, and chaff, and, in addition, to give certain foods which were generally believed to have the property of checking "scouring." Among the suggestions which have been made to minimise the risk of "scouring" from mangel-feeding have been the feeding of the roots in limited quantity, the giving of undecorticated cotton cake (the husk of this being astringent), the use of long hay in abundance, the giving of bean meal, and so on.

It was determined to try the three last-named. Inasmuch as the very purpose of the experiment was to see to what extent mangels might be used without actually causing "scouring," the experiment must be looked on as such, and not as one on the *fattening* of stock by the different methods of feeding employed. Mangels were accordingly given to the bullocks in increasing quantities, the animals carefully watched, and, as soon as signs of "looseness" began to be noticed, the respective additional foods were increased, when possible, with the view of seeing whether they were successful or not in preventing the "scouring."

The bullocks were weighed at intervals, and their live and carcass weights recorded as usual; but, for the reasons given above, this did not constitute the real point of the experiment.

The bullocks experimented on were twelve Shorthorns, rising three years old, which had been purchased the previous May and had been since kept at the Farm under the same conditions. At the time the experiment began they were valued at 14*l.* 15*s.* a head.

On December 1, 1898, after being fed first thing in the morning on a limited ration, the twelve bullocks were weighed at about 10 A.M., and divided into three lots of four each, the foods assigned to them at commencement being as follows:

Per head daily	Lot I.	Lot II.	Lot III.
	lb.	lb.	lb.
Linseed cake	4	4	6
Oat-straw chaff	6	6	6
Meadow hay chaff	3	3	3
Long hay	3	3	5
Undecorticated cotton cake	2	—	—
Bean meal	—	2	—

Practically, Lot I. had 2 lb. per head daily of the undecorticated cotton cake given to them, and Lot II. 2 lb. per head daily of bean

meal, to see if these additions prevented the "scouring," while, in the case of Lot III., linseed cake was given up to 6 lb., to make up for the extra cotton cake or bean meal that Lots I. and II. had. The quantity of long hay, starting at 5 lb. per head daily, was left to be increased as soon as there was any sign of "looseness" in the animals. Mangels were used in the following way: they were brought in from the pits and kept in the feeding shed, being left exposed there for two or three days before they were used, and they were sliced twelve hours before using.

On December 2, 1898, the bullocks of all three lots began with 28 lb. per head daily of mangels, and as after a week's feeding there was no sign of "looseness," the quantity was increased on December 11 to 35 lb. a day each. This seemed too much for them, as, almost at once, most of the bullocks showed signs of "scouring"; this was especially the case with No. 2 (cotton cake), Nos. 6 and 8 (bean meal), and No. 11 (hay); these animals were all uneasy, Nos. 6 and 11 being feverish, and breaking out into a sweat and not feeding properly.

Thus far it would seem that 28–30 lb. of mangels could be given quite well at starting, but that 35 lb. was too much; also that none of the additional foods exercised any marked influence, or superiority one over the other, in stopping the "scouring."

The bullocks in Lots I. and II. had not got properly used to the undecorticated cotton cake and bean meal, and so it was of no use to increase the quantities of these. The bullocks preferred, indeed, to eat their litter when it was put in, though they had not taken their feed of cake and chaff. The animals in Lot III. (hay) had their amount of long hay increased by 2 lb., viz. to 7 lb. a head daily, and they took this better than the mixed chaff.

The bullocks began to get better in a few days, and by December 17 only No. 8 (bean meal) and No. 11 (hay) remained excessively "loose." No. 11 had recovered by December 21, and No. 8, though still slightly "loose," looked and fed well again.

On January 1, 1899, the additional foods were increased, viz., the cotton cake (Lot I.) to 4 lb. per head daily, bean meal (Lot II.) to 4 lb., and another 1 lb. of linseed cake was given to each animal of Lot III. (long hay).

Hay chaff was now given to all the animals instead of the mixture of oat-straw chaff and hay chaff, and the quantity of chaff was raised from 9 lb. per head daily to $10\frac{1}{2}$ lb., long hay remaining at 3 lb. in Lots I. and II., and at 7 lb. in Lot III.

The beasts now having taken regularly the 35 lb. of mangels per head daily, the quantity of roots was still further increased on January 1 to 40 lb. In Lot I. (cotton cake) Nos. 1 and 2 were slightly affected, but recovered by the end of the week; Nos. 3 and 4 were perfectly right; in Lot II. (bean meal) three bullocks were lightly "loose," one not at all; in Lot III. (hay) all four bullocks became very "loose," and continued fully a week so; they sweated profusely, seemed faint and listless, and ejected their excreta in a very watery state. Their coats became also markedly rough and "staring."

Observations taken again on January 16, 1899, showed all the bullocks in Lot I. (cotton cake) to be going on well; in Lot II. (bean meal) only one (No. 8) was slightly "loose," and the others quite satisfactory; while in Lot III. (hay) all were still "loose," two of them (Nos. 9 and 12) so badly that they were off their feed, and the roots had to be reduced again to 35 lb. per head daily.

By January 21 this last lot (III.) were better, but had not thoroughly picked up again, and it was useless to increase the roots. But Lots I. and II. had gone on so well that the allowance of mangels was further increased to 45 lb. per head daily.

On January 28 all the bullocks were weighed after limited feeding in the early morning, and they showed fairly uniform increase, except in the case of No. 12 (hay), which had all along been a bad "doer," and it was thought well at this stage to turn him out of the experiment altogether.

The details of weights and gains are given in Table I., p. 563.

The experience up to this point had been to show clearly that the giving of hay in quantity had been quite useless in checking "scouring," but that, if care was taken in the feeding, by giving such additional foods as undecorticated cotton cake and bean meal, the quantity of mangels given to bullocks could be gradually raised from 28 lb. to 35 lb., and then successively to 40 lb. and 45 lb. per head daily without doing harm.

Long hay having failed, the plan of feeding Lot III. was from this time altered, and after the weighing of January 28 this set had given them :—

Linseed cake	4 lb. per head daily.
Decorticated cotton cake	4 " " "

in place of the 7 lb. linseed cake that had been previously supplied.

Long hay was still fed as before, also hay chaff, about 7–8 lb. hay chaff and 9–10 lb. long hay being the quantity of each taken. At the same time the cake to Lot I. (undecorticated cotton cake) was increased by 1 lb. of each sort, as also the cake and meal to Lot II. (bean meal), making the quantities per head daily in these cases :—

Lot I.		Lot II.	
Linseed cake	5 lb.	Linseed cake . .	5 lb.
Undecorticated cotton cake .	5 "	Bean meal . .	5 "

The mangels were also increased to 50 lb. per head daily in Lots I. and II. on January 31.

The bullocks seemed a good deal "blown out" by the mangels, but did not exhibit any "looseness." The three remaining animals in Lot III. (formerly hay lot) showed a surprising improvement with the altered feeding, and from that time went on much more satisfactorily.

By March 19 it was clear that the bullocks in Lot I. (undecorticated cotton cake) had not made the progress that those of Lot II. (bean meal) had, and so it was decided to give them another 1 lb. (making 6 lb. in all) per head daily of linseed cake to finish them

Table I.—*Live Weights of the Bullocks at each Period, Gains in Live Weight, Fasted Live Weights, Carcass Weights, &c.*

No.	Live weights			Gain in			Fasted live weight	Carcass weights in stones of 8 lb.
	December 1	January 28	March 24	57 days	55 days	112 days	March 25	
	c. qr. lb.	c. qr. lb.	c. qr. lb.	lb.	lb.	lb.	c. qr. lb.	st. lb.
LOT I.—UNDECORTICATED COTTON CAKE.								
1	10 3 23	11 2 16	11 3 10	77	22	99	11 2 15	99 6
2	10 2 7	11 2 0	12 0 26	105	82	187	11 3 24	93 1
3	11 0 0	11 3 14	12 2 16	98	86	184	12 1 1	96 1
4	10 3 10	11 2 16	12 0 24	90	64	154	12 0 17	97 0
Total .	43 1 12	46 2 18	48 3 20	370	254	624	48 0 1	386 0
				Average per head .		156	12 0 0	96 4
LOT II.—BEAN MEAL.								
5	10 2 3	11 2 21	12 2 2	130	93	223	12 1 2	101 3
6	10 2 0	11 2 0	12 2 20	112	132	244	12 1 3	102 0
7	11 1 16	12 1 0	13 0 10	100	94	194	12 2 16	101 1
8	10 3 21	11 3 0	12 1 18	91	74	165	12 0 8	97 4
Total .	43 1 12	47 0 21	50 2 22	433	393	826	49 1 1	402 0
				Average per head .		206½	12 1 7	100 4
LOT III.—HAY to January 28, then DECORTICATED COTTON CAKE.								
9	11 1 12	12 1 4	13 1 0	104	108	212	12 3 10	102 5
10	10 1 18	11 1 3	12 1 4	97	113	210	11 3 10	96 4
11	10 3 4	11 2 13	12 2 8	93	107	200	12 0 4	93 4
Total.	32 2 6	35 0 20	38 0 12	294	328	622	36 2 24	292 5
No. 12	10 2 20	10 3 10		Average per head .		207⅓	12 0 27	97 4
	43 0 26	46 0 2						

off. On March 24 all the animals were weighed, after a limited morning feed, their fasted live weights were taken next morning, and they were slaughtered, the carcass weights being recorded by Mr. Forrester, the farm manager.

It will be noticed that No. 1 (Lot I.) did not gain as much as the others of this set. In explanation, it may be pointed out that when put up he was (along with Nos. 7 and 10, *i.e.* one in each lot) one of those most forward in condition, but throughout the experiment he had always shown a nervous, restless disposition, and when killed ultimately he was found to have an abscess on the diaphragm, while imbedded in this was a piece of wire, and a couple of 2-inch nails were also found in the second stomach. Nevertheless, he was the "ripest" bullock of the four of his lot. Whether this animal be taken into consideration or not, the general conclusion is the same, viz., that of the additional foods bean meal undoubtedly did the best in respect of fattening. During the second period, however, the increase from the giving of decorticated cotton cake with linseed cake was very satisfactory. Bullock No. 12 (hay lot), which had been thrown out of the experiment after the first weighing on January 28, was closely examined after being slaughtered, to find, if possible, the cause of his not having done well. Beyond ascertaining that the liver contained a considerable number of flukes, there was no unsoundness apparent.

As regards the influence of the respective foods, undecorticated cotton cake, bean meal, and long hay, in checking tendency to "scour," close observation throughout the experiment led to the following conclusions :—

1. That well-ripened mangels given in moderate quantity, say, 28 lb. to 30 lb. per head daily, can be quite well fed to fattening bullocks in the early stages, in place of swedes, if along with them be given either common cotton cake, bean meal, or a plentiful supply of long hay.
2. That as soon as the quantity of mangels reaches 35 to 40lb. per head daily, "scouring" will probably appear.
3. That when this is the case the giving of long hay in quantity will prove no palliative.
4. That both undecorticated cotton cake and bean meal will soon check the tendency to "scour," and that, of the two, bean meal proves the more satisfactory by giving the larger increase in live weight.

From general observation made during this experiment it was noticeable that the feeding with mangels produced, in the early stages at least, a feverishness about the animals which is not the case when swedes are similarly fed. The animals, however, always took the quantity supplied to them with much avidity. It was clear, moreover, that mangels can, if there is necessity, be quite well substituted for swedes even in the early stages of feeding, provided a small quantity only—say, not exceeding 30 lb. per head daily for 3-year old bullocks—be given at first, and that along with these cotton cake or bean meal be used. Further, this quantity of mangels may

TABLE II.—*Live Weights of Sheep in the Wool, at each Period, Gains in Live Weight, Fasted Live Weights, Carcass Weights, &c.*

SHEEP FED ON MANGELS.

No.	Live weights				Gain in				Fasted live weights	Carcass weights in stones of 8 lb.
	December 20	January 25	March 13	April 10	36 days	47 days	28 days	111 days	April 11	April 13
	c. qr. lb.	c. qr. lb.	c. qr. lb.	c. qr. lb.	lb.	lb.	lb.	lb.	c. qr. lb.	st. lb.
1	1 0 9	1 1 3	1 2 1	1 2 20	22	26	19	67	1 2 10	10 7
2	1 0 5	1 0 26	1 1 18	Died Mar. 26	21	20	—	41	—	9 2
3	1 0 2	1 0 13	1 1 6	1 1 22	11	21	16	48	1 1 14	10 0
4	1 0 0	1 0 11	1 1 0	1 1 16	11	17	16	44	1 1 6	9 0
5	1 0 6	1 0 21	1 1 13	1 2 10	15	20	25	60	1 1 24	10 5
6	1 0 4	1 0 12	1 1 4	1 1 18	8	20	14	42	1 1 12	9 5
7	1 0 10	1 1 0	1 1 21	1 2 7	18	21	14	53	1 2 1	10 5
8	1 0 0	1 0 20	1 1 14	Killed April 6	20	22	—	42	—	10 2
9	1 0 3	1 0 19	1 1 19	1 2 12	16	28	21	65	1 2 2	11 0
10	1 0 6	1 0 24	1 1 19	1 2 7	18	23	16	57	1 1 25	10 6
11	1 0 2	1 0 23	1 1 2	1 1 23	21	7	21	49	1 1 16	10 2
12	1 0 0	1 0 19	1 1 9	1 1 22	19	18	13	50	1 1 7	9 3
13	1 0 6	1 0 21	1 1 13	1 2 2	15	20	17	52	1 1 22	10 2
14	1 0 11	1 1 4	1 2 1	1 2 18	21	25	17	63	1 2 7	11 5
Total	14 2 8	16 2 20	19 1 0	18 1 9	236	288	209	733	17 1 6[1]	143 4

Average gain per head daily, 1st period (14 sheep) . . . . . ·468 lb.
" " " " 2nd " (14 ") . . . . ·438 "
" " " " 3rd " (12 ") . . . . ·622 "

[1] 12 sheep only.

be increased gradually up to 45 lb. or 50 lb. as feeding goes on, without doing any harm.

Table I., p. 563, sets out in detail the weights recorded at the different periods, the gains, carcass weights, &c.

Supplementary Experiment with Sheep on Mangels.

While the above experiment with bullocks was in progress a pen of 14 sheep—Hampshire and Oxford cross—ten months old, and similar to those used in the sheep-feeding experiment with gorse recorded subsequently (p. 567), was set aside on December 20, and to these sheep mangels were given, the sheep having until then been on grass with just a few swedes thrown out to them. From December 20, when they were weighed and penned on the arable land, the sheep received mangels only as succulent food in place of swedes. The additional dry foods given them were $\frac{1}{4}$ lb. linseed cake and $\frac{1}{2}$ lb. undecorticated cotton cake per head daily, with hay chaff *ad libitum*. The sheep were kept on mangels until April 9, and then killed. Two sheep of the number were removed in the course of the trial, one (No. 2) dying on March 26 from inflammation of the lungs, and another (No. 8) was killed on April 6 and found to have diseased kidneys. There was, however, no "scouring" effect whatever produced by the feeding of the mangels, and it would appear, therefore, that mangels can quite well be fed to sheep from the commencement of root feeding, in place of swedes, if about $\frac{1}{2}$ lb. per head daily of undecorticated cotton cake be given along with the food.

Attention has been directed to the harm that may be caused to male sheep by the feeding of mangels freely, there being a tendency to act on the kidneys, produce increased secretion of urine, and, in extreme cases, the formation of crystals in the urethra. In the above experiment one-half of the fourteen sheep were male, the other half female. The sheep that died on April 6 was a male sheep, and the kidneys were, as stated above, certainly affected, though the bladder was not.

Table II. (p. 565) gives the weights of the sheep at different periods, and may be taken in conjunction with the similar table (p. 573) of the experiment on sheep feeding with gorse. It will be noticed that there was much greater irregularity at first in the way that the sheep n the mangels did, as compared with those fed on swedes.

J. Augustus Voelcker.

13 Hanover Square, W.

GORSE AS A FOOD FOR SHEEP.

At the Woburn Experimental Farm there is, on the hillside of one of the fields of the farm, a very poor and sandy piece of land upon which no satisfactory crop could be got to grow. On this, as an experiment, gorse was drilled in May 1897, the variety tried being that known as "French" gorse. No manure was used, and a barley crop was first put in, gorse being drilled between alternate rows of the barley, and thus in rows about 18 in. apart. The barley was once more a poor crop, but the gorse came up fairly regularly; the plant was just visible, about 2 to 3 in. high, through the winter, and it began to shoot out at the end of April 1898. Two horse-hoeings during summer were the only cultivation required, and by October the gorse was ready for cutting. The crop cut during the winter weighed 11 tons per acre.

It was decided, as the gorse came all right, to see how it would do for sheep-feeding, and, chiefly, how far it would replace roots, and so come in usefully in the event of a failure of the root crop or a short supply of roots. There being no machine on the farm for preparing the gorse, it had, after cutting, to be sent some distance off to a farm where there was a proper gorse-crushing machine. In consequence of the distance the gorse was only sent twice a week.

Two lots of sheep, Hampshire and Oxford cross, about ten months old, fourteen in each pen, were selected, and to both lots linseed cake and hay chaff were to be given. To one lot roots were intended to be supplied, as much as the sheep would take, while to the other gorse was to be fed *ad libitum*, and the rest of the diet made up, if necessary, with roots.

The sheep were weighed on November 30, 1898, about 10 A.M., after receiving, first thing in the morning, a limited ration of 6 lb. per head of swedes and $\frac{1}{2}$ lb. of mixed linseed cake and hay. The sheep were at this date valued at 37*s.* 6*d.* apiece. The experiment then began, and the sheep in Pen I. had at first about 20 lb. of swedes per head daily, while those in Pen II. took about $1\frac{1}{2}$ lb. of gorse per head daily, and the additional swedes were restricted in amount to $11\frac{1}{2}$ lb. per head daily. It was found, however, that the sheep did not eat nearly as much gorse as was expected, and the additional roots did not prove enough. So, after a week, the roots had to be increased to $14\frac{1}{4}$ lb. per nead daily. Still this was not

enough, and, the sheep eating less than 2 lb. of gorse, the roots, after a fortnight, had to be further increased to 20 lb.

The gorse when fresh was taken very readily, but, the weather being very windy, the gorse dried quickly, and then seemed to get too dry and prickly for the sheep. About January 1, however, it was found that, by putting the gorse through the machine twice instead of once as previously, it was much better and was not nearly so prickly when dry. When brought in fresh the sheep would eat as much as $2\frac{1}{2}$ lb. each daily of the gorse, but as it got staler they would not consume it so readily. The best way of dealing with it was found to be to spread it, when brought fresh from the machine, to a depth of 3 to 4 in. on a stone floor. This kept it fairly moist. Damping the gorse with water before using it was tried, but was not found to answer well.

On January 25 the two lots of sheep were weighed, and the weights with respective gains are given in Tables II. and III., on pages 572 and 573.

Summarised the results at this time were :—

—	Gain in live weight		
	14 sheep in 57 days	Per head in 57 days	Daily gain per head
	lb.	lb.	lb.
PEN I. Swedes only . .	248	$17\frac{5}{7}$	·310
„ II. Swedes and gorse	301	$21\frac{1}{2}$	·377

During this period the foods consumed were :—

—	I. (Swedes only)		II. (Swedes and gorse)	
	Total	Per head daily	Total	Per head daily
	t. c. qr. lb.	lb.	t. c. qr. lb.	lb.
Linseed cake	0 3 2 16	·50	0 3 2 16	·50
Hay	0 2 2 24	·38	0 2 2 24	·38
Swedes	8 1 0 12	22·61	6 12 1 0	18·56
Gorse	—	—	0 9 0 25	1·3

Thus, practically, 1 lb. of gorse took the place of 3 lb. of swedes. By looking at the details in Table II. (p. 572) it will be noticed that one sheep (No. 10) in Pen I. gave no increase in live weight at the end of the first period. This sheep had a bad cold, which afterwards developed into a kind of malignant catarrh; the subsequent weighing of March 13 gave an actual loss in the case of this sheep,

but by the time of the weighing of April 4 the animal had recovered, and went up in weight before being slaughtered.

The conclusion, however, is general that the sheep fed on the gorse in addition to roots did decidedly better than those fed on roots alone, and this whether No. 10 sheep be taken into account or not.

After January 25 the linseed cake given to each lot was increased to $\frac{3}{4}$ lb. per head daily, and so the sheep went on until the next period of weighing, on March 13. During this interval, however, two more of the sheep, Nos. 4 and 11, developed bad colds just as No. 10 had done, and this in each case turned to a form of malignant catarrh, marked by a profuse yellow mucus running from the nose. No. 4 lost 14 lb. in live weight, No. 10, 7 lb., and No. 11 gained only 1 lb. during this second period. The detailed weights and gains are given in Tables II. and III., on pages 572 and 573. It will be seen that while there were certain losses in the case of Pen I., all the sheep in Pen II. (gorse-fed) showed a fair gain, and the results of the first period were again borne out. All the gorse-fed sheep, too, kept quite well throughout.

As after this second weighing of March 13 about one-half the number of sheep in each pen were fit to kill, seven were selected from each lot, and their fasted live weights taken in the usual way on March 14. They were sent off to Aylesbury and killed the same afternoon, the carcass weights being taken the following day in the presence of the farm manager, Mr. Forrester.

It was seen that there was a marked difference between the carcasses of the sheep of the respective pens. Not only were the carcass weights of the gorse-fed sheep better, but, on looking over the lot of fourteen carcasses, the butcher being asked to pick out the ones which he considered best, selected seven, and of these seven no less than six came from the pen fed on gorse. These were much fatter about the kidneys, and were generally "riper." It was a matter of general observation, the butcher remarked, that sheep that season were turning out badly. This he attributed to the poor quality of the roots, and the gorse-fed sheep he thought decidedly above the average and certainly the best lot of sheep he had so far had. This view was confirmed by his customers, and they were loud in their praises of the mutton of the gorse-fed sheep, describing it as possessing that "herby" flavour peculiar to sheep fed on the Brighton Downs.

The remainder of the sheep—seven out of each pen—were fed on until ready to kill. The linseed cake given to them was increased from $\frac{3}{4}$ lb. per head daily to 1 lb., and on April 4 the next weighing

was taken, the fasted live weights on April 5, and the sheep sent to Aylesbury and killed, the carcass weights being recorded on April 5 by Mr. Forrester as before.

Once more it was noted that the carcasses of the gorse-fed sheep were superior to those of the sheep fed on swedes only. Sheep No. 4 (roots-fed), which had been ill for some time, was so backward in condition that he was not killed with the rest, but had to be kept on longer. In the column of carcass weights in Table II. allowance is made for him on the average of the remainder. It will be seen that the total carcass weight of the fourteen sheep of Pen II. (gorse-fed) was distinctly higher than that of the fourteen sheep of Pen I., fed on swedes only.

As regards the food consumed during this second period of 47 days, we have :—

—	I. (Swedes only)		II. (Swedes and gorse)	
	Total	Per head daily	Total	Per head daily
	t. c. qr. lb.	lb.	t. c. qr. lb.	lb.
Linseed cake . . .	0 4 1 12	·75	0 4 1 12	·75
Hay	0 2 0 7	·34	0 2 0 7	·34
Swedes	7 7 1 18	25·1	6 11 1 0	22·4
Gorse	—	—	0 8 0 22	1·4

Accordingly 1·4 lb. of gorse took the place of 2·7 lb. of swedes, or, practically, 1 lb. of gorse replaced 2 lb. of roots, as against 3 lb. of roots in the first period. This difference is due, no doubt, to the fact that the roots given to the gorse-fed sheep were limited in the early stages so as to make the sheep eat more of the gorse, whereas, this not succeeding, in the second period the sheep had more roots, and the quantity of gorse consumed was that which they took by choice. At first the gorse, being a strange food to them, was only taken by keeping the roots low, but, later on, when they had become accustomed to the new food, the sheep ate it readily up to a certain quantity.

As usual, samples of all the foods used were taken at intervals during the progress of the experiment and submitted to analysis. As the only differences in kind or quantity were in the roots and the gorse, it will be sufficient to set out the average composition of these. In the case of the gorse, however, it is of interest to give separately, as in Table I., the analyses of samples taken at the different periods of cutting, as these show very clearly how in the early stages the gorse is more juicy and gets gradually

less so as it becomes more mature; also how the woody fibre increases with age and the nitrogenous constituents increase. The differences noted in the sand contained in the ash are due, no doubt, to the gorse when cut young being shorter and closer to the ground, and thus getting more of the earthy matter from the land thrown upon it.

TABLE I.—*Composition of Swedes and Gorse used during Experiment.*

—	Swedes	Gorse			
	Average	As fed during Dec. '98	As fed during Jan. '99	As fed during Feb. '99	Average
Moisture	91·34	66·03	58·89	42·93	55·95
Ether extract (fat, chlorophyll, &c.)	—	·89	1·22	1·39	1·17
* Nitrogenous matters	1·11	3·91	4·85	7·09	5·28
Soluble carbohydrates, digestible fibre, &c.	5·89	13·56	18·72	27·03	19·77
Woody fibre	1·04	12·57	13·72	18·83	15·04
† Mineral matter (ash)	·62	3·04	2·60	2·73	2·79
	100·00	100·00	100·00	100·00	100·00
* Containing nitrogen	·18	·62	·78	1·13	·84
† Including sand	·02	1·82	1·00	·64	1·15

CONCLUSIONS.

In commencing this experiment it was intended to let gorse replace, as far as it would, the use of roots, seeing that in the event of a failure of roots, or a short root-crop, gorse might come in as a very useful substitute, especially in the case of very poor land. A main point of the experiment was, therefore, to see to what extent the replacement of roots by gorse could be effected. The results show very clearly that the replacement could only be made to a limited extent, and that, at most, $2\frac{1}{2}$ lb. of gorse per head daily would be consumed, taking the place of, say, 6 lb. of roots. But, with this limitation, the gorse did exceedingly well as a food, and exercised a pronounced benefit upon the sheep, alike as regards their general health, their increase in live weight, and the excellence of the meat produced, so that the use of gorse as an additional food to sheep is decidedly to be recommended.

It may be mentioned incidentally that the feeding of the sheep this season resulted in a very good profit.

Table II.—*Live Weights of the Sheep, in the Wool, at each Period, Gains in Live Weight, Fasted Live Weights, Carcass Weights, &c.*

PEN I.—SHEEP ON SWEDES.

No.	Live weights: Nov. 29, 1898	Live weights: Jan. 25, 1899	Live weights: March 13	Live weights: April 4	Gain in live weight: In 57 days	Gain in live weight: In 47 days	Gain in live weight: In 22 days	Gain in live weight: Total period	Fasted live weight	Carcass weight in stones of 8 lb.
	c. qr. lb.	c. qr. lb.	c. qr. lb.	c. qr. lb.	lb.	lb.	lb.	b.	c. qr. lb	st. lb.
1	1 0 25	1 1 14	1 1 26	1 2 18	17	12	20	49	1 2 11	10 7
2	1 0 15	1 1 3	1 1 22	—	16	19	—	35	1 1 17	10 1
3	1 0 26	1 1 16	1 2 13	—	18	25	—	43	1 2 4	11 2
4	1 0 4	1 0 26	1 0 12	1 0 24	22	−14	12	20	1 0 23	* 9 6
5	0 3 26	1 0 15	1 1 4	—	17	17	—	34	1 0 24	8 5
6	1 0 2	1 0 24	1 1 11	1 2 4	22	15	21	58	1 1 24	10 1
7	1 0 19	1 1 6	1 1 27	—	15	21	—	36	1 1 17	10 2
8	1 0 6	1 0 22	1 1 3	—	16	9	—	25	1 0 27	9 1
9	1 0 14	1 1 3	1 1 20	—	17	17	—	34	1 1 14	9 7
10	1 0 13	1 0 13	1 0 6	1 1 1	—	−7	23	16	1 0 23	8 1
11	1 0 0	1 0 21	1 0 22	1 1 16	21	1	22	44	1 1 8	8 4
12	1 0 11	1 1 5	1 1 21	1 2 21	22	16	31	69	1 2 11	10 6
13	1 0 1	1 0 26	1 1 14	—	25	16	—	41	1 1 5	9 2
14	1 0 2	1 0 22	1 1 9	1 2 2	20	15	21	56	1 1 20	10 2
Total .	15 0 24	17 1 20	18 3 4	—	248	162	150	560	19 1 4	136 7

* Estimate on average of rest.

TABLE III.—*Live Weights of the Sheep, in the Wool, at each Period, Gains in Live Weight, Fasted Live Weights, Carcass Weights, &c.*

PEN II.—SHEEP ON SWEDES AND GORSE.

No.	Live weights				Gain in live weight				Fasted live weight	Carcass weight in stones of 8 lb.
	Nov. 29, 1898	Jan. 25, 1899	March 13	April 4	In 57 days	In 47 days	In 22 days	Total period		
	c. qr. lb.	c. qr. lb.	c. qr. lb.	c. qr. lb.	lb.	lb.	lb.	lb.	c. qr. lb.	st. lb.
1	1 0 24	1 1 17	1 2 8	—	21	19	—	40	1 2 1	10 4
2	1 0 17	1 1 13	1 2 5	1 2 24	24	20	19	63	1 2 15	12 1
3	1 0 21	1 1 14	1 1 26	1 2 18	21	12	20	53	1 2 9	11 2
4	1 0 9	1 1 6	1 1 20	1 2 21	25	14	29	68	1 2 7	10 4
5	0 3 26	1 0 13	1 0 27	1 1 17	15	14	18	47	1 1 9	9 1
6	1 0 1	1 0 25	1 1 11	—	24	14	—	38	1 1 4	8 6
7	1 0 16	1 1 12	1 2 4	—	24	20	—	44	1 1 24	10 5
8	1 0 6	1 0 25	1 1 12	—	19	15	—	34	1 1 8	9 5
9	1 0 16	1 1 10	1 2 3	—	22	21	—	43	1 1 25	11 1
10	1 0 12	1 0 26	1 1 7	1 1 25	14	9	18	41	1 1 16	9 6
11	1 0 0	1 0 27	1 1 14	1 2 9	27	15	23	65	1 2 2	10 3
12	1 0 6	1 0 27	1 1 10	1 2 11	21	11	29	61	1 2 24	10 1
13	1 0 4	1 1 0	1 1 15	—	24	15	—	39	1 1 12	9 7
14	1 0 5	1 0 25	1 1 13	—	20	16	—	36	1 1 8	9 4
Total	15 0 23	17 3 16	19 3 7	—	301	215	156	672	20 1 24	142 2

J. AUGUSTUS VOELCKER.

13 Hanover Square, W.

Notes, Communications, and Reviews.

THE SUMMER OF 1899.

It is very doubtful whether the present century has witnessed a summer at once so fine, so warm, and so dry as that which has recently passed away. For the country as a whole there are, unfortunately, no reliable meteorological records extending back for more than five-and-twenty or thirty years. Prior to this the observations were made only at a few scattered places, and even in some of these the methods of taking them left much to be desired. When so exceptional a season occurs as that of the present year, the inquirer is therefore at a loss to find any basis for an adequate comparison, most of the existing records being left so far behind. For Greenwich there are, however, observations of temperature and rainfall of an unimpeachable character dating back as far as the year 1841, and from these it may be gathered that the past summer was the warmest experienced since 1868 and the driest since 1864. With these two exceptions it was not only as warm, but also as dry, as anything recorded during the whole period of close on sixty years. The sunshine records at Greenwich do not cover nearly so long a period, no systematic observations having been made earlier than 1876. Since then there has certainly been no summer so bright as the last, the only seasons to compare with it being those of 1887 and 1897.

The summer commenced with fine dry weather, lasting throughout the earlier half of June. In the latter part of that month, however, and the first week in July the atmosphere fell into a far less settled state, rain being somewhat frequent, with thunderstorms in not a few places. After this the weather again settled down into a fine, dry, and very warm condition, the improvement lasting until the close of the third week in July, when severe thunderstorms and heavy rains were experienced in many parts of the country. At the end of the month the weather improved, and until very nearly the close of August was almost always fine, warm, and dry, the only material exception occurring between the fifth and seventh, when thundery conditions again set in for a time. In the southern counties the wheat harvest was secured at an unusually early date and under the most advantageous conditions, the continued dry weather

Temperature, Rainfall, *and* **Bright Sunshine** *experienced over* **England** *and* **Wales** *during the Fourteen Weeks ended September* 2, 1899.

(The Summer Season.)

Districts	Temperature							
	Highest observed	Lowest observed	Day temperatures		Night temperatures		Day and night temperatures combined	
			Mean	Difference from average	Mean	Difference from average	Mean	Difference from average
	°	°	°	°	°	°	°	°
North-eastern counties . .	87	32	67·4	+3·0	51·7	+0·7	59·6	+1·9
Eastern counties . . .	90	32	70·3	+2·1	52·5	+1·4	61·4	+1·7
Midland " . . .	89	30	72·6	+4·4	51·0	+0·8	61·8	+2·6
Southern " . . .	90	34	72·4	+4·2	54·5	+1·5	63·5	+2·9
North-western counties, including North Wales .	87	31	68·0	+2·9	53·5	+1·5	60·8	+2·2
South-western counties, including South Wales .	90	32	70·6	+5·2	54·0	+1·5	62·3	+3·3
Channel Islands . . .	85	41	69·5	+4·0	57·7	+2·2	63·6	+3·1

Districts	Rainfall				Bright Sunshine			
	Days with rain		Total fall		Duration		Percentage of possible amount	
	Number	Difference from average	Amount	Proportion of average amount	Hours recorded	Difference from average	Percentage	Difference from average percentage
			ins.	per cent.				
North-eastern counties .	33	−14	4·9	64	568	+ 89	36	+ 5
Eastern counties . .	27	−19	4·0	52	814	+184	53	+12
Midland "	26	−20	4·0	50	755	+228	49	+14
Southern "	22	−22	3·8	53	912	+248	60	+16
North-western counties, including North Wales	36	−14	7·0	73	736	+184	47	+11
South-western counties, including South Wales	28	−23	5·5	56	909	+257	60	+17
Channel Islands . . .	25	−25	3·6	50	966	+246	65	+

NOTE.—The above Table is compiled from information given in the Weekly Weather Report of the Meteorological Office. The averages employed are: For Temperature, the records made during the twenty-five years, 1871–95; for Rainy Days, the values for the fifteen years, 1881–95; for Total Rainfall, those for the thirty years, 1866–95; and for Bright Sunshine, those for the fifteen years, 1881–95.

proving, however, less beneficial to the root crops and also to the pastures, which rapidly assumed a very parched aspect. After August 23 or 24 a gradual break up occurred, and towards the close of the month rain fell very generally, the amount in the southern and eastern districts being, however, too slight to prove of much benefit to the crops, or of any real service in replenishing the water supply, the latter being in some places alarmingly deficient. Early in September the rainfall became more plentiful, but in many parts of the country it was not sufficient to make up for the large deficiency, which had been gradually accumulating for so many months past.

The leading features in the weather of the summer are shown in a statistical form on p. 575, the following remarks giving further details of interest in the history of each particular element.

Temperature.—With the exception of a short period about the middle of June the mean temperature was constantly above the average, the excess being mostly slight in the earlier half of the season, but very large in the second and third weeks in July and the first and fourth weeks in August. For the season as a whole the mean temperature was consequently very high, the excess ranging from a little under 2° in the north-eastern and eastern counties to very nearly 3° in the southern, and to more than 3° in the south-western counties and the Channel Islands. In July and August the night temperatures were unusually high, but throughout the season generally the excess of warmth was greatest in the day time, this being especially the case in the more central and southern parts of the country. In the midland and southern counties the day temperatures for the whole season were more than 4°, and in the south-western counties more than 5° above the average. A comparison with previous seasons shows that over the country generally the summer was the warmest experienced for very many years past. In London it was much warmer than anything on record since at least the year 1871, the only seasons that at all compared with it being, in the order named, those of 1876, 1893, 1897, and 1887. The highest temperatures of the summer occurred as a rule on August 25, when the thermometer in the shade rose to 85° or more in nearly all districts, and to 90° in London, as well as at Cambridge and Llandovery (Carmarthenshire). Over the eastern, central, and southern parts of the country, however, the thermometer rose very nearly, and in some cases quite, as high on or about July 20, the readings on this occasion being also above 85° in many places, and as high as 90° at Cambridge. In most districts the extreme temperatures were rather higher than those registered in the summer of 1898, but about the same as in 1897. It may be remembered, however, that in the eastern, central, and southern parts of the country the highest readings of last year occurred not in the summer season proper, but in the month of September, the temperatures on or about the 8th of that month being a trifle higher than anything recorded this year. The lowest temperatures of last summer occurred in the week ending June 3, and mostly on May 28, a date lying outside

the proper boundary of the summer season. In many parts of the country the sheltered thermometer at this time fell to the freezing point or even a trifle below it. The nights were, however, almost as cold on or about June 14, and although the sheltered thermometer did not quite touch the freezing point, there were many places in which slight frost occurred on the surface of the ground. At Hillington, in Norfolk, the thermometer on the grass fell on the night of the 14th to a minimum of 28°. Leaving out of account the low readings of May 28, the absolute minima for last summer were not quite so low as those registered in the season of 1898 or of 1895; they were, however, lower than in 1897, 1896, or 1894.

Rainfall.—This was almost throughout very deficient, the only times with any general excess being the third and fourth weeks in June and the last week in August. In the third week in July there was an excess, but only in the northern and extreme southern parts of the country. Taking the season as a whole the rainfall was exceedingly deficient, not only as regards quantity but also with respect to frequency. Excepting in the north-west the total amount was in no district equal to two-thirds of the average, and in the eastern and southern counties it was little more than half, while in the midland counties and the Channel Islands it was only just one-half the normal quantity. The deficiency in the number of days with rain was quite as remarkable as in the aggregate fall, this feature being especially marked in the southern counties and the Channel Islands, where the total number was only one-half of the normal. Over the south of England as a whole the summer was apparently not quite so dry as that of last year, while in the north-east the amount of rain in the two seasons was about equal. In all other districts, however, the past summer was the driest experienced for several years past, the remark applying with special force to the south-eastern corner of England. As regards the London district, a record kept at Brixton since the year 1866 shows no such previous summer either as regards the amount or the frequency of rain. During the three summer months the total fall at Brixton was only 2·08 inches (or 30 per cent. of the average), the nearest approach to such an amount occurring, singularly enough, last year, when the total was 2·67 inches. In no other summer of the past 33 years did the rainfall at Brixton amount to less than 3 inches. For Greenwich a longer record is available. From this it would appear that the amount of rain last summer (2·83 inches) was the smallest registered at the Observatory since the year 1864, or with that single exception in any of the past 58 years. The only other summer with a rainfall under 3 inches was in 1869, when the total was 2·91 inches; in 1898 the amount of rain at Greenwich was as much as 3·95 inches, or more than an inch in excess of the quantity registered this year. In August last the total fall at Greenwich was about a tenth of an inch smaller than anything registered since, at least, the year 1841, and from a comparison with a less reliable record, going back very nearly to the beginning of the century, it would appear to have been the driest August since the

year 1818. The heaviest individual falls of rain experienced last summer were associated in nearly all cases with thunderstorms, the latter being somewhat rare in the south-eastern districts, but unusually frequent in most other parts of the country. The periods of greatest electrical disturbance occurred about the following times: (1) Between June 27 and July 1, when nearly all districts were affected, the rainfall being heavy at many western stations. (2) Between July 6 and 8, and mostly on July 7; on the 8th a very heavy fall of rain and hail occurred at Canterbury. (3) Between July 20 and 23, the storms being especially severe in the southern and eastern districts; the falls of rain on the 22nd and 23rd were in many cases extremely heavy, the largest amounts of which we have at present any notice being on the 23rd, when 3·3 inches fell at Portsmouth, 2·8 inches at Broomfield Hall, Chelmsford,[1] and 2·3 inches at Sudbury.[1] On the 22nd, at Cullompton (in Devonshire), a fall of 1·9 inch was registered in two hours. (4) Between August 3 and 7, and more particularly on the 4th and 5th, the fall of rain being again heavy in many of the western districts. (5) On August 14 and 15, but especially on the latter date, when very severe storms over the eastern and midland counties were accompanied by torrential rains and destructive falls of hail; at Hillington (Norfolk) the rainfall amounted to 1·5 inch. (6) Between August 27 and 31, the rain being again heavy in places, but not so large as on many previous occasions.

Bright Sunshine.—With the exception of the third and fourth weeks in June the duration of sunshine was almost always in excess of the average, the brightest periods of all being the earlier half of June and the first and fourth weeks in August. Taking the summer as a whole, the amount of sunshine was consequently very large, especially over all the more central and southern parts of the country, where the total number of hours was greatly in excess of anything recorded for many years past. At Greenwich Observatory the duration was by far the largest observed since the recording instrument was started in 1876, the only summers to compare with it being those of 1887 and 1897. Last summer the total duration at Greenwich was 756 hours; in 1887 it amounted to 715 hours, and in 1897 to 651 hours, the only other summer with more than 600 hours being 1877. It is rather singular to notice that with the exception of this year each of these very sunny seasons occurred at intervals of 10 years. In the north-east of England the duration of sunshine last summer was scarcely so great as in 1897. It will be seen by the table that in the southern and south-western districts the total amount of sunshine for the past season was over 900 hours, giving a mean per day of more than $9\frac{1}{4}$ hours; in the Channel Islands the mean daily amount was nearly 10 hours. According to the average, based on 15 years' observations, the mean

[1] The values for these places have been obtained from *Symons's Monthly Meteorological Magazine.*

daily amount for the summer in the southern and south-western districts is about $6\frac{3}{4}$ hours. In the Channel Islands the average is rather under $7\frac{1}{4}$ hours, so that in the past summer the mean daily duration there was nearly three hours in excess of that registered in a normal season.

RECENT AGRICULTURAL INVENTIONS.

The subjects of Applications for Patents from June 12 *to Sept.* 7, 1899.

N.B.—Where the Invention is a communication from abroad, the name of the Inventor is shown in italics, between parentheses, after the name of the applicant.

Agricultural Machinery and Implements, &c.

No. of Application. Year 1899.	Name of Applicant.	Title of Invention.
12250	McGregor, A.	Sheaf-binding harvesters.
12257	Kohlert, C.	Ploughs.
12318	Oram, F. H.	Tillage machines.
12319	Jackle, B.	Roller threshing and crushing machines.
12329	Harper, C.	Sheaf-header appliance for threshing machines.
12408	Darby, T. C., & ors.	Cultivators.
12536	Barugh, J., & Elder W. K.	Multitine mould-board for ploughs.
12880	Petersen, C. J. M.	Corn binders.
12881	Penniall, A., & anr.	Mowing apparatus.
13109	Bamford, J.	Chaff-cutting machine.
13519	Wood, G.	Mowing crops.
13574	Baurmann	Double harrow.
13749	Creasy, A.	Hoe for root crops.
13768	Sorenson, C.	Harrows.
13772	Marsland, W.	Raising and stacking hay.
13884	Cottis, C.	Gathering and transporting hay.
14058	Hailey, H.	Chaff-cutters.
14088	Doman, A.	Chain harrows.
14179	Dobbing, J.	Hay-making machine.
14522	Green, J.	Machine for sowing seeds.
14611	Nixon, F.	Screens for threshing machines.
14630	Prenderville, H.	Hoe, partly applicable as a plough.
15251	Bowmar, G.	Convertible harvester and traction engine.
15270	Hadden, H. J. (*Mandel & Co., Austria-Hungary*)	Plough carriages.
15289	Anderson, C. E.	Ploughs.
15520	Seaborn, E.	Fixing knives in chaff-cutters.
15819	Mealor, J.	One-way ploughs.
15905	Higgs, F. M.	Swivel-action cultivators.
15936	Smallman, H. A.	Hay turner.
16058	Keller, F., & anr.	Ploughs.
16203	Wippermann, W.	Mowing machines.
16434	Massey, E.	Mechanically gathering, sorting, and sacking potatoes.

No. of Application. Year 1899.	Name of Applicant.	Title of Invention.
16489	WHITNEY, C. H., & anr.	Combined seed planting and fertilising implement.
16570	HADDAN, R. (*The Plano Manufacturing Co. U.S.A.*)	Grain binders.
16758	HORNSBY, W., & anr.	Mowing and reaping machines.
16817	KUBICEK, F.	Grain-sorting apparatus for threshing machines.
17200	NIELSEN, P.	Delivery apparatus for mowers for transforming them into reapers.
17841	BUSH, W. C.	Fastening for harvester knives.
18122	GOLBY, F. W. (*E. Ullmann, Germany*)	Wheat ear raising apparatus.

Stable Utensils and Fittings—Horse-shoes, &c.

12465	REID, J., & LEE, J.	Pneumatic horse collars, &c.
12709	LEWIS, J. & anr.	Nosebags.
12815	SIMPSON, H. & S.	Shaft tug.
12947	STOHWASSER, F. J., & anr.	Spurs.
12991	WARTNABY, G.	Horse-shoes.
13164	NOAD, J., & anr.	Bridle for driving without bit.
13264 } 13265 }	BARNARD, G. J., & anr.	Horse-shoes.
13313	MEARS, C., & ors.	Cushioned horse-shoes.
13618	RÉGEL & RICHTER	Saddle pads.
13803	NOBES, G.	Device for controlling runaway horses.
13942	LADLEY, G.	Horse-shoes.
14689	SCOTT, J. & anr.	Safety stirrups.
14754	WILLIAMS, W. O.	Kneecap.
14758	EDMONDSON, R.	Horse-shoe.
14777	SCATTERGOOD, A.	Horse-collars.
14940	CHISWELL, W.	Horse-shoe.
15075	COLE, A.	Horse-boots.
15195	SORELL, S.	Protecting horses from excessive heat.
15352	FULSTER, M. F.	Horse-shoes.
15446	MONTGOMERY, G. A.	Fastening of covers to horses.
15449	LATHAM, R.	Safety bits.
15574	KONDAKOV, W.	Nailless horse-shoes.
15878	RADFORD, J. F.	Horse-shoes.
16229	LIGGINS, E.	Shaft tugs.
16232	SEFTON-JONES, H. (*Berwick, W. New South Wales*)	Non-slipping horse-shoe.
16240	MURDOCH, R.	Horse sunshade.
16291	BURCHER, W. H., & anr.	,, ,,
16312	TAFF, R. J.	Preventing horses from bolting.
16368	POWELL, E., & anr.	Horse-shoes.
16651	PETERSON, C. A.	Nosebags.
16860	SCHÖNING, K.	Stopping runaway horses.
16895	SPRAGUE, R. H.	Mechanical brush for cleaning horses.
16958	RAPP, J.	Safety stirrup.
17081	WELCH, J.	Horse-shoes.
17151	DYSON, W. G.	Saddle pad.
17170	RICHTER, H.	Bit for breaking in horses.
17213	,,	Saddle pads.
17449	BIRCH, C.	Stirrups.

Dairy Utensils, &c.

No. of Application. Year 1899.	Name of Applicant.	Title of Invention.
12237	THOMPSON, W. P. (*Daseking, Germany*)	Drum for milk separators.
13156	WILLIAMS, H. C. .	Preserving milk churns.
13420	RYMILL, J. R. . .	Cheese and butter cutters.
14383	BARTLETT, B., & anr. .	Churns.
15304	TUBBS, H. J., & anr. .	Churns.
16196	TUSSAUD, F. B. . .	Automatic carriage for milk churns.
17077	DRAPER, B., & anr. .	Milk cans.
17150	WEBSTER, W. T., & ors.	Fat-testing instruments for milk.
17868	LINKIEWICZ . .	Machine for moulding and cutting butter.
17957	FOWLER, J. H. . .	Jars for milk.

Poultry and Game, &c., Appliances.

12370	CALVERT, T. H. . .	Incubators.
12686	HARGREAVES, H. .	Poultry houses.
13273	BENNETT, I. . .	Foster-mothers.
14083	BINGHAM, J. A. . .	Testing eggs.
14634	HEALY, J. . . .	Drinking trough for poultry.
15461	WILSON, D. D. & J. .	Composition for treating eggs.
15788	LYONS, J. & H. . .	Apparatus for testing eggs.
15948	WILSON, W. J. . .	Egg rest for incubators.
16101	BLAND, C. H. M. .	Fowl houses.
18136	O'BRIEN, A. H., & anr.	Machines for plucking feathers.

Miscellaneous.

12419	PACKE, J. G. . .	Sheep-shearing apparatus.
13692	NEAVERSON, M. A. R.	Feeding appliance for sheep.
14006	HARVEY, R. R. . .	Production of organic extracts and serums of blood containing organic ferments and their application for increasing the milk of dairy cattle, &c.
15350	MARRIOTT, E. M. L. .	Tethering gear.
16863	LEACH, E. H. . .	Stocks for animals.

Numbers of Specifications relating to the above subjects published since June 10, 1899.[1]

(Price 8*d.* each copy.)

Specifications of 1898.

13864, 15564, 15725, 16232, 16377, 16718, 16789, 17076, 17417, 17519, 17982, 18222, 18937, 19705, 19746, 20939, 21472, 21857, 22119, 22170, 22340, 22372, 22446, 23783, 24900, 25444.

Specifications of 1899.

2564, 6607, 7812, 8055, 8501, 8531, 9525, 10214, 11326, 11704, 12329, 13264, 13265, 13313, 14651.

---

[1] Copies may be obtained at the Patent Office (Sale and Store Branch), Quality Court, Chancery Lane, London, E.C.

STATISTICS AFFECTING BRITISH AGRICULTURAL INTERESTS.

Agricultural Returns of Great Britain, 1899.

Preliminary Statement for 1899, compiled from the Returns collected on June 5; and comparison with previous Years.

A.—1899 and the two previous years.

Crops	1899	1898	1897
	Acres	Acres	Acres
Wheat	2,000,981	2,102,206	1,889,161
Barley	1,982,108	1,903,666	2,035,790
Oats	2,959,755	2,917,760	3,036,056
Potatoes	547,682	524,591	504,914
Clover & Rotation Grasses — For Hay	2,214,883	2,381,551	2,285,965
Clover & Rotation Grasses — Not for Hay	2,593,068	2,529,799	2,567,843
Total	4,807,951	4,911,350	4,853,808
Permanent Pasture — For Hay	4,339,025	4,536,315	4,510,333
Permanent Pasture — Not for Hay	12,291,662	12,023,077	12,002,535
Total	16,630,687	16,559,392	16,512,868
Hops	51,843	49,735	50,863
Live Stock	No.	No.	No.
Cows & Heifers in Milk or in Calf	2,671,260	2,587,190	2,532,379
Other Cattle:—2 years & above	1,341,310	1,381,595	1,323,230
„ 1 year & under 2	1,388,511	1,345,844	1,360,741
„ Under 1 year	1,394,639	1,307,735	1,284,147
Total of Cattle	6,795,720	6,622,364	6,500,497
Ewes kept for Breeding	10,460,837	10,137,932	10,006,697
Other Sheep:—1 year & above	6,040,600	6,203,858	6,219,001
„ Under 1 year	10,736,227	10,401,404	10,114,742
Total of Sheep	27,237,664	26,743,194	26,340,440
Sows kept for Breeding	375,911	362,200	334,244
Other Pigs	2,247,902	2,089,395	2,008,058
Total of Pigs	2,623,813	2,451,595	2,342,302

B.—1899 compared with 1898.

Crops	Increase		Decrease	
	Acres	Per cent.	Acres	Per cent.
Wheat	..	..	101,225	4·8
Barley	78,442	4·1	..	..
Oats	41,995	1·4	..	..
Potatoes	23,091	4·4	..	..
Clover & Rotation Grasses — For Hay	..	..	166,668	7·0
Clover & Rotation Grasses — Not for Hay	63,269	2·5	..	..
Total	..	..	103,399	2·1
Permanent Pasture — For Hay	..	..	197,290	4·3
Permanent Pasture — Not for Hay	268,585	2·2	..	..
Total	71,295	0·4	..	..
Hops	2,108	4·2	..	..
Live Stock	No.	Per cent.	No.	Per cent.
Cows & Heifers in Milk or in Calf	84,070	3·2	..	..
Other Cattle :—2 years & above	..	..	40,285	2·9
,, ,, 1 year & under 2	42,667	3·2	..	..
,, ,, Under 1 year	86,904	6·6	..	..
Total of Cattle	173,356	2 6	..	..
Ewes kept for Breeding	322,905	3·2	..	..
Other Sheep :—1 year & above	..	..	163,258	2·6
,, ,, Under 1 year	334,823	3·2	..	..
Total of Sheep	494,470	1·8	..	..
Sows kept for Breeding	13,711	3·8	..	..
Other Pigs	158,507	7·6	..	..
Total of Pigs	172,218	7·0	..	..

Acreage of Hops.

Preliminary Statement compiled from the Returns collected on June 5, 1899, showing the Acreage under **HOPS** in each County of England in which Hops were grown, with a Comparative Statement for the Years 1898, 1897, and 1896.

Counties	1899	1898	1897	1896
	Acres	Acres	Acres	Acres
Berks	—	—	—	4
Gloucester	42	40	40	49
Hants	2,319	2,263	2,306	2,494
Hereford	7,227	6,651	6,542	6,895
Kent	31,988	30,941	31,661	33,300
Monmouth	—	2	2	—
Salop	138	126	129	140
Suffolk	4	3	2	4
Surrey	1,388	1,313	1,416	1,623
Sussex	4,949	4,829	5,174	5,908
Worcester	3,788	3,567	3,591	3,800
Total	51,843	49,735	50,863	54,217

Note.—The following counties show *increases*, to the extent named, in 1899 :—Kent, 1,047 acres ; Hereford, 576 acres ; Worcester, 221 acres ; Sussex, 120 acres ; Surrey, 75 acres ; Hants, 56 acres ; Salop, 12 acres ; Gloucester, 2 acres ; Suffolk, 1 acre. The only *decrease* is Monmouth, 2 acres. The effective *increase on the year* is 2,108 acres.

Areas of **Cereal Crops, Potatoes,** *and* **Hay,** *and Numbers of* **Cattle, Sheep,** *and* **Pigs** *in England, Wales, Scotland, and Great Britain (as returned on June* 5) *in* 1899 *and (on June* 4) *in* 1898.

Crops		England	Wales	Scotland	Great Britain
		Acres	Acres	Acres	Acres
WHEAT . . .	1899	1,899,827	53,898	47,256	2,000,981
	1898	1,987,385	58,960	55,861	2,102,206
Difference in 1899 . .		−87,558	−5,062	−8,605	−101,225
BARLEY . .	1899	1,635,634	105,978	240,496	1,982,108
	1898	1,562,761	102,921	237,984	1,903,666
Difference in 1899 . .		+72,873	+3,057	+2,512	+78,442
OATS . . .	1899	1,781,649	220,233	957,873	2,959,755
	1898	1,731,157	230,670	955,933	2,917,760
Difference in 1899 . .		+50,492	−10,437	+1,940	+41,995
POTATOES . .	1899	387,715	32,982	126,985	547,682
	1898	365,432	32,797	126,362	524,591
Difference in 1899 . .		+22,283	+185	+623	+23,091
HAY FROM CLOVER AND ROTATION GRASS .	1899	1,622,603	198,046	394,234	2,214,883
	1898	1,779,341	199,959	402,251	2,381,551
Difference in 1899 . .		−156,738	−1,913	−8,017	−166,668
HAY FROM PERMANENT GRASS LAND	1899	3,753,807	457,173	128,045	4,339,025
	1898	3,932,220	474,492	129,603	4,536,315
Difference in 1899 . .		−178,413	−17,319	−1,558	−197,290
Live Stock		No.	No.	No.	No.
CATTLE . .	1899	4,841,852	736,691	1,217,177	6,795,720
	1898	4,674,303	701,777	1,246,284	6,622,364
Difference in 1899 . .		+167,549	+34,914	−29,107	+173,356
SHEEP . . .	1899	16,260,327	3,416,357	7,560,980	27,237,664
	1898	15,886,538	3,268,708	7,587,948	26,743,194
Difference in 1899 . .		+373,789	+147,649	−26,968	+494,470
PIGS . . .	1899	2,225,420	258,154	140,239	2,623,813
	1898	2,078,898	238,581	134,116	2,451,595
Difference in 1899 . .		+146,522	+19,573	+6,123	+172,218

NOTE.—The *Difference* lines show the increase (+) or decrease (−) in 1899, as compared with 1898.

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

THE WOBURN FIELD EXPERIMENTS, 1898.

A GENERAL account of the Woburn experiments up to the year 1897 inclusive has been published in this Journal, Vol. VIII. (Parts II. and IV.), 1897, and Vol. IX. (Part IV.), 1898. Also in Vol. IX. (Part III.), 1898, there is a note on the quality of the experimental corn crops grown in 1897.

The present report continues the account of the experiments, giving the results for the year 1898.

A. CONTINUOUS CORN GROWING (*STACKYARD FIELD*).

1. CONTINUOUS GROWING OF WHEAT, 1898 (22ND SEASON).

After the previous wheat crop had been removed, the land was scuffled on Sept. 2, 1897, harrowed on Sept. 8, and ploughing began on Sept. 22. The variety of wheat sown was "Stand Up," a white wheat, this being a change to the land, it having previously been generally cropped with "Browick" wheat (a red wheat), sometimes the red and sometimes the white-chaff variety being used. The quantity of seed drilled was 9 pecks per acre, this being done on Oct. 12, 1897.

There was no alteration from previous years in the manures used; these are given in Table I. (page 589). Owing to the prevalence of windy weather after sowing, mineral manures could not be put on until Oct. 26, by which time the wheat was just beginning to show, especially on plots 10b (rape cake) and 11b (farmyard manure). Mineral manures were sown on plots 4, 5, 6, 8, and 9, on Oct. 26.

On Nov. 12 it was noticed that the wheat on the top part of plot 2 was very weak, the blades being quite yellow and much deformed. Some blades never pushed themselves above the ground, while others pushed through and then died away. Already in 1896 there had been a slight failure of plant on this plot, and transplanting, about the end of April, had then to be done and succeeded. Again in 1897 there was increased failure, and a larger strip, say some 40 square yards, where the plant had failed entirely, had to be transplanted. Up to this date, however, the ultimate yield, through the transplanting, was satisfactory.

In November, 1897, the failure of plant was still more pronounced, and had gone to such an extent that it was seen that transplanting would no longer do. From chemical considerations there was reason to suspect that there was, owing to the continued use of ammonia salts, a drain on the land in respect of lime, in which constituent it will be remembered the soil of Stackyard Field was very deficient (containing, in 1877, only 0·308 per cent. of lime in the first depth of 9 inches and 0·205 per cent. in the second 9 inches).

It was further noticed that on this plot (2), and generally on those manured with ammonia salts, the soil was of a distinctly lighter colour; this was clearly visible when the land was ploughed. Also, on these plots there was considerable growth of green algæ, the presence of which generally indicates the need of liming. Whether the failure of plant was due to actual deficiency of lime, or to an acid or unhealthy condition of the soil, can only be determined by further investigation. But, as a first step, it was thought desirable to try the effect of applying lime to this land, and, accordingly, plot 2 was divided into two equal halves, 2a and 2b, and while 2a was left as it was, to 2b lime at the rate of 2 tons per acre was applied on Dec. 18, 1897. The lime was Buxton lime, applied direct to the growing crop and left to lie on the surface of the plot; after a day or two it was raked by hand evenly over the plot. It did no harm whatever to the crop.

On Feb. 11 farmyard manure (which had been made Dec. 6–23 in boxes by bullocks feeding on decorticated cotton cake, maize meal, swedes, and hay chaff, with wheat straw as litter, and which was subsequently kept under cover) was spread on plot 11b; the weight of dung was 6 tons 16 cwt. to the acre, estimated to contain nitrogen equal to 200 lb. ammonia per acre. On Feb. 28 finely ground rape cake was put on plot 10b, the weight being 15 cwt. per acre, and it contained nitrogen equal to 100 lb. ammonia per acre.

The winter 1897–8, it will be remembered, was a very mild one, and the wheat got very forward during the early spring, the dung and rape cake plots (11b and 10b) showing especial luxuriance.

About the middle and end of March, however, there were snowstorms and north-easterly winds, followed by prolonged drought throughout April. During this time the different unmanured plots suffered most. The half-plot 2b, on which lime had been put after ammonia salts, at this time looked slightly better than the unlimed half. May, however, was a very wet month. The dung and the rape cake plots were still looking about the best of all, the rape cake especially so, and having a darker look than the dung plot. As between these two manures it has now been remarked for some time that the dung acts the more quickly, but that the rape cake subsequently catches it up, and by May the rape cake plot looks darker in colour and, as a rule, is better than the dung plot.

On plots 8a and 8b (8a had ammonia salts in 1897, when it gave 8 bushels more per acre than 8b where the application was omitted), 8a showed distinctly the influence of some of the former year's application, being much darker in colour than 8b.

The wheat on plot 2, before any ammonia salts were put on this year, had also a darker colour than on any other plot, and was in this respect in marked contrast to plot 3 (nitrate of soda), where, however, there had been no failure of plant.

A remarkable effect of the lime on 2b was to destroy spurry, a weed which was very prevalent on the unlimed half, and, indeed, on all the plots where ammonia salts had been used.

The two plots 9a and 9b (9a having had nitrate of soda in the previous year, but 9b not) showed no difference, there being apparently no residue from the previous application of nitrate of soda, a result in this respect unlike that shown in the ammonia salts plots.

Plot 4 (minerals only) at first was somewhat ahead of the unmanured plots 1 and 7, but gradually all three came to about a level. In fact, No. 4, as the produce shows, was rather the poorest, but this is accounted for by the influence of some trees adjoining the plot, the roots of which appear to have reached the plot and probably robbed it to some extent of its moisture.

Of the plots 5 and 6 (nitrogenous manures with minerals), plot 5 was decidedly the better, and indeed, speaking generally, the ammonia salts plots were better than those treated with nitrate of soda.

The top-dressings of ammonia salts and nitrate of soda were applied on May 6, 1898, the ammonia salts consisting of equal

weights of sulphate of ammonia and muriate of ammonia; 179 lb. per acre, in all, was the amount put on plots 2 and 5, and double this quantity on plot 8b, 8a receiving none. The nitrate of soda applied to plots 3 and 6 was 254 lb. per acre in quantity, and double this amount to plot 9b, plot 9a receiving none this year. These salts were put on in a single application. Wet weather in May caused considerable trouble in keeping the plots clean, and had probably much to do with the ultimate superiority, this year, of the ammonia salts plots over the nitrate of soda plots.

These appearances were generally maintained until harvest time. All the nitrate plots, and, to a less extent, the rape cake plot, were very badly attacked by "rust," the dung plot slightly also, but the ammonia salts plots were quite free from the disease.

The crop stood up well on all the plots, despite the fact of there being several heavy thunderstorms at the end of July and beginning of August. The crop was cut on all the plots on August 11, carted 10 days later, and stacked in the field.

The wheat was threshed in the field on October 28, and dressed and weighed on November 2. Subsequently, on March 22, 1899, the produce of each plot was examined and valued by experts, Mr. R. Hewlins of St. Ives and Mr. Few of Cambridge. The values assigned were upon the basis of 27*s*. per quarter of wheat weighing 63 lb. per bushel—that is, 27*s*. per quarter of 504 lb.

Table I. (page 589) gives the harvest results and the quality of the corn.

It will be remarked that the two unmanured plots 1 and 7 agreed very closely, and the produce was considerably in excess of the unmanured yield of any year since 1894.

Plot 4 (minerals alone) was lower produce, probably on account of the trees, as noted before. Ammonia salts throughout, as the appearance of the plots indicated, gave much better results than nitrate of soda.

The influence of lime on plot 2b, although this was only applied on December 8, 1897, already showed itself in an increase of 4 bushels of corn.

The highest yield of all the plots was that of 8b (ammonia salts applied with minerals), viz. 54·8 bushels, this being the second highest produce ever obtained, but even where ammonia salts were not put on this year (plot 8a) the produce was distinctly high, and far above the average (23·1 bushels) of past years for this plot.

On the other hand the produce of 9a, where nitrate of soda

Table I.—*Continuous Growing of Wheat*, 1898 (22*nd Season*).

(Wheat grown year after year, on the same land, the manures being applied every year.)

Stackyard Field—Produce per acre.

Plot	Manures per acre	Head corn Wght.	Head corn No. of bush.	Head corn Wgt. per bush.	Tail corn Weight	Straw, chaff, &c. c.	q.	lb.	Value per quarter s.	d.	Remarks
		lb.		lb.	lb.	c.	q.	lb.	s.	d.	
1	Unmanured	806	13·6	59·2	43	12	0	20	26	6	Very weak
2a	[1] Ammonia salts (containing 50 lb. ammonia)	1,703	27·8	61·2	32	22	1	0	28	0	Very well grown
2b	Ammonia salts (containing 50 lb. ammonia), with 2 tons lime December 1897	1,922	31·5	61·1	46	25	0	23	28	0	Stronger than plot 2a and a little more "bloom." Better than plot 4
3	Nitrate of soda (containing nitrogen = 50 lb. ammonia)	1,117	20·6	54·1	136	23	3	4	24	0	Worst of all plots. Grains shrivelled and blighted
4	[2] Mixed mineral manures (sulphates of potash, soda, and magnesia, with superphosphate)	716	11·9	60·4	35	11	2	7	27	6	Stronger than plots 1 and 7, slightly stronger than plot 5
5	Mixed mineral manures and ammonia salts (containing 50 lb. ammonia)	2,835	45·9	61·8	79	36	1	8	28	6	Best of all plots. Exceedingly well grown and good colour, very thin skinned
6	Mixed mineral manures and nitrate of soda (containing nitrogen = 50 lb. ammonia)	1,909	33·3	57·4	165	31	2	22	25	6	Grains shrivelled and blighted, somewhat better than plot 3
7	Unmanured	870	14·5	60·2	41	14	1	17	27	6	About equal to plot 4
8a	Mineral manures, ammonia salts (= 100 lb. ammonia) omitted (in alternate years, including 1898)	2,535	41·3	61·4	57	31	1	8	27	6	Much better grown than plot 9a, not so strong as plot 8b, but better grown
8b	Mineral manures and (in alternate years, 1898 included) ammonia salts (= 100 lb. ammonia)	3,397	54·8	62·0	79	41	2	26	28	6	Better than plot 9b, stronger than plot 8a, and worth more
9a	Mineral manures, nitrate of soda (containing nitrogen = 100 lb. ammonia) omitted (in alternate years, including '98)	992	17·2	57·7	73	19	0	5	26	6	Great many shrivelled corns, somewhat better grown than plot 9b, but not so strong
9b	Mineral manures and (in alternate years, 1898 included) nitrate of soda (containing nitrogen = 100 lb. ammonia)	1,985	34·0	58·4	160	32	2	15	27	0	Better than plot 9a
10a	1889, rape cake (= 50 lb. ammonia). No manure since	1,269	21·0	60·4	37	16	2	7	27	0	Much like plot 11a, better colour than plot 10b, but not so strong
10b	Rape cake (= 100 lb. ammonia) every year since 1890	2,362	39·5	59·8	98	37	1	15	27	6	Better colour than plot 11b
11a	1877–81, farmyard manure (= 200 lb. ammonia). No manure since	1,526	25·8	59·2	53	19	1	14	27	0	Rather stronger than plot 10a
11b	Farmyard manure (= 200 lb. ammonia) every year	2,321	39·2	59·2	80	37	0	17	28	0	Stronger than plot 10b and much better than plot 11a

[1] Ammonia salts are equal weights of sulphate of ammonia and muriate of ammonia.

[2] Mixed mineral manures are, throughout, 3½ cwt. superphosphate of lime, 200 lb. sulphate of potash, 100 lb. sulphate of soda, 100 lb. sulphate of magnesia per acre.

had been omitted, was only 17·2 bushels, and thus only 3 bushels above the unmanured produce.

With regard to the rape cake and farmyard manure plots the produce was much alike, and also well above the average. Where these manures had not been applied for several years, there was still shown to some extent the influence of previous manurings, and these were evidently not yet exhausted.

Passing next to the *quality* of the grain, Table I. shows how relatively large was the amount of tail corn on all the plots manured with nitrate of soda (plots 3, 6, and 9b). Simultaneously with this the weight per bushel of the dressed corn was lower in these plots than in any of the others, and notably below that of the wheat manured with ammonia salts.

It may be here mentioned that up to 1896 inclusive the tail corn had not been separately returned, but it had been the habit to count it in with the "straw, chaff, etc." In 1877, and now again in 1898, the head corn and tail corn were separately returned. The observations of the valuers and the respective figures assigned by them will be found in Table I.

The general observation made was that the wheats were, as a whole, above the average; and, with the exception of plots 3 and 6 (where nitrate of soda had been used), there was not a bad sample. The wheat on these nitrate of soda plots was composed of small shrivelled grain, and was in marked contrast to that produced with ammonia salts (plots 2 and 5), the corn of plot 5 (ammonia salts and minerals) being the best of all the series, and being described as "exceedingly well grown and of good colour."

These points were in exact correspondence with the observations made in the previous year on the 1897 crop (see Journal R.A.S.E., Vol. IX., 1898, page 553).

Rape cake and farmyard manure produced grain of average quality.

2. Continuous Growing of Barley, 1898 (22nd Season).

The barley plots of 1897 were scuffled on Sept. 2, 1897, and again on Oct. 19. The land was ploughed on Nov. 25, and again on Feb. 16, 1898. Barley ("Golden Melon") was drilled at the rate of 9 pecks per acre on Feb. 26, 1898. Farmyard manure (made in boxes and in similar manner to that used for the wheat experiments just described) was spread as a top-dressing immediately after sowing the barley. Rough weather

in March prevented the satisfactory sowing of mineral manures and rape cake, and these were not put on until April 14.

In the general report of the experiments on continuous barley-growing (Journal R.A.S.E., Vol. VIII., 1897, pages 287–9), reference was made to the failure of plant which had for the past few years been making itself more and more apparent in the case of the plots on which ammonia salts had been used. This matter has been fully dealt with in the report aforenamed, and it is only necessary to repeat here that, as was set out in the case of the wheat plots, the determination was taken to try the effect of applying lime to one-half of each of the ammonia salts plots.

Ever since 1889, indeed, there had been noted a tendency in the plots heavily manured with ammonia salts to "go off," and for the plant not to ripen properly. Plot 2 (ammonia salts alone) was the next to show this tendency, and since 1894 there has been each year a markedly lower produce on this plot as compared with plot 3 where nitrate of soda alone was used. Gradually the plot became worse and worse, and each year resowing or transplanting was more difficult, until in 1897 only 9 bushels of corn per acre were produced on plot 2 (ammonia salts alone) as against 21 bushels on plot 3 (nitrate of soda alone).

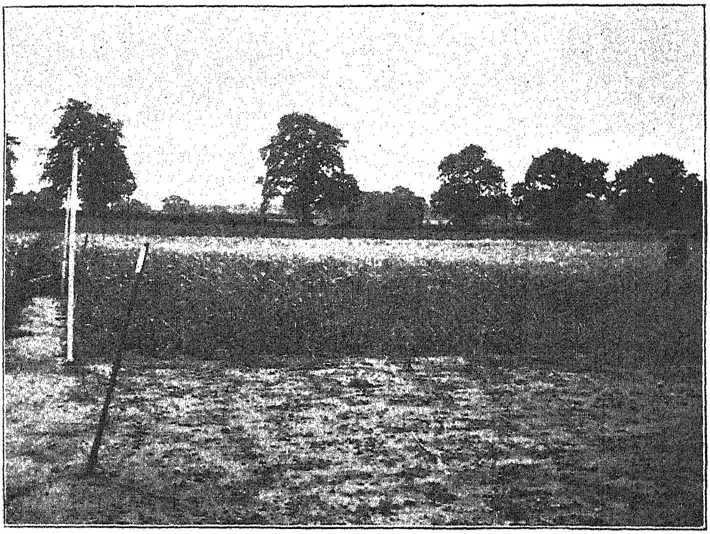
Plot 8 (ammonia salts and minerals) in 1895 gave results much below plot 9 (nitrate of soda and minerals), and this has gone on since.

Plot 5 in 1895 suddenly began to fail in similar manner, and its produce has, too, been every year since much below the corresponding nitrate of soda plot (6). A peculiar characteristic of these ammonia salts plots, moreover, has been that, while the barley failed, any oats, whether cultivated or wild, which happened to be mixed with the seed barley, throve most luxuriantly. This being so, lime was tried experimentally in the same way as with the wheat, and in November 1897 each of the plots 2, 5, 8a, 8b, was divided into two halves, and lime (Buxton lime) was applied to one half at the rate of 2 tons per acre on Nov. 25. The lime was spread on the land in its caustic state, and ploughed in a few days later.

On May 20, 1898, the nitrogenous top-dressings were applied, the quantities being the same as in the case of the wheat crop.

Plot 4 (minerals only), as usual, looked decidedly better in the early stages than the unmanured plots 1 and 7. Plot 3 (nitrate of soda alone) was very thin, and looked as if it were going to fail, until the top-dressing was put on, when it quickly

pulled up. The most striking feature of all was the wonderful effect produced thus early by the application of lime in the preceding November. While the barley was almost a complete failure on all four half-plots, 2a, 5a, 8a, 8b, on those where lime had been put, 2b, 5b, 8aa, 8bb, the land seemed to have in great measure recovered its fertility, and quite average crops were the result. Thus, on plot 2b (limed) 16·5 bushels were obtained as against 7·6 bushels on the unlimed half 2a, 35·3 bushels on 5b (limed) against 4·5 bushels on 5a (unlimed), 27·1 bushels on 8aa (limed) against 19·5 bushels on 8a (unlimed), and 38·6 bushels on 8bb (limed) against 22·5 bushels on 8b (unlimed).



2b

2a

FIG. 1.—View of plots 2a and 2b on July 30, 1898. Barley manured with ammonia salts year after year since 1877. 2a (in foreground), ammonia salts only. 2b (in background), ammonia salts only, after application of 2 tons lime per acre November 25, 1897.

The two accompanying illustrations show the marked effect produced by the application of lime. Fig. 1 is a view of plots 2a (unlimed) and 2b (the same after the application of 2 tons of lime in November 1897). While 2a is practically barren, wherever the lime has gone the crop is restored.

Fig. 2 shows the same effect in the case of plots 5a (unlimed) and 5b (limed). Here, not ammonia salts alone, but these in conjunction with mineral manures, have been applied. The same clear benefit accruing to the use of lime is exemplified, though in this case such absolute sterility of land has not yet

been reached with plot 5a as was the case where ammonia salts had alone been applied (plot 2a) since the beginning of the experiments. The liming had the effect of producing a plant all over, and after the application of lime the effect of top-dressing with ammonia salts was once more apparent.

The nitrate of soda plots gave, however, better returns with the barley crop than did ammonia salts, even where lime had been applied, and the difference was clearly marked in the more even ripening, the barley with ammonia salts not ripening at all uniformly. The highest yield was obtained on plot 9b, with

5b

5a

FIG. 2.—View of plots 5a and 5b on July 30, 1898. Barley manured with ammonia salts and minerals year after year since 1877. 5a (in foreground), ammonia salts and minerals only. 5b (in background), ammonia salts and minerals only, after application of 2 tons lime per acre November 25, 1897.

nitrate of soda and minerals, viz. 43·9 bushels: this crop was, however, very badly laid, as also was that of plot 6 (37·5 bushels).

Rape cake (plot 10b) and farmyard manure (plot 11b) both gave good yields.

The brightest-looking crops when in the field were those to which no nitrogenous manurings had been given, and this, it is noticeable, was borne out in the subsequent valuations of the produce. These were plots 4 and 9a in particular, whereas in the case of the wheat 9a was about the worst crop of all both in corn and straw.

Plot 1 (unmanured) gave a lower yield than its duplicate

(plot 7), but this was owing to the plot having been damaged by hares, and plot 7 gives the fairer average return. Plot 10a was similarly damaged, and this is the probable cause of the yield being lower than it would ordinarily have been.

The general yield was below the average, the farmyard plot (11b) alone giving above an average crop. The full results are set out in Table II., page 595, along with the valuation of the corn and the observations of the experts, Messrs. Few and Hewlins. The values were reckoned on a basis of 29*s.* per quarter for barley weighing 56lb. per bushel, that is, 29*s.* per quarter of 448 lb.

There was a great difference between the best and the worst samples, the best being nice barleys and above the average.

The best of all was plot 4 (mineral manures only), then 9a, 10a, 11a, to none of which nitrogenous manures had been applied. The produce of 11b, which promised so well in the field, got damp in the stack, and so did not turn out as good a sample as it would otherwise have done.

It is noticeable that, unlike in the case of the wheat, nitrate of soda did not, as compared with ammonia salts, act prejudicially when mineral manures were used along with it. As observed, however, the best samples resulted after abstention from the use of nitrogenous salts, nitrate of soda used alone (plot 3) giving the thinnest barley of all.

B. ROTATION EXPERIMENTS (*Stackyard Field*), 1898.

The Journal R.A.S.E., Vol. VIII. (Part IV.), 1897, and Vol. IX. (Part IV.), 1898, contains full accounts of the rotation experiments together with the results of cropping until 1897. The general outcome of these was that the experiments had, in consequence of the influence of the clover crop in the rotation, failed to bring out the expected differences between the manurial values of decorticated cotton cake and maize meal. It was necessary, accordingly, to make some further and decided change in the plan of experiment, by means of which the differences in manurial value might be brought out. As a preliminary to any such change it was essential, before recommencing, to bring the plots as nearly as possible to the same level of fertility, otherwise the new comparisons would be made on an uneven basis. In view of the influence exercised by the clover, it was decided as far as possible to bring to its natural conclusion each rotation then in progress, and, then, by taking two or more crops of barley without manure, to equalise the land.

TABLE II.—*Continuous Growing of Barley*, 1898 (22*nd Season*).

(Barley grown year after year, on the same land, the manures being applied every year.)

Stackyard Field—Produce per acre.

Plot	Manures per acre	Head corn: Wght.	Head corn: No. of bush.	Head corn: Wgt. per bush.	Tail corn: Weight	Straw, chaff, &c.			Value per quarter		Remarks
		lb.	lb.	lb.	lb.	c.	q.	lb.	s.	d.	
1	Unmanured	582[1]	11·5[1]	50·5	26	8	3	17	30	0	Better in colour and quality than plot 7
2a	[2] Ammonia salts (containing 50 lb. ammonia)	396	7·6	52·3	22	4	2	22	28	0	
2b	Ammonia salts (containing 50 lb. ammonia), with 2 tons lime November 1897	867	16·5	52·4	53	12	2	2	21	6	Much coarser than plot 2a, worst of all the plots
3	Nitrate of soda (containing nitrogen = 50 lb. ammonia)	1,181	23·9	49·5	63	16	1	3	26	6	Better than plot 2b
4	[3] Mixed mineral manures (sulphates of potash, soda, and magnesia, with superphosphate)	957	18·5	51·6	22	10	0	14	32	6	Best of all the plots, more even than 9a
5a	Mixed mineral manures and ammonia salts (containing 50 lb. ammonia)	239	4·5	53·0	14	3	3	6	25	6	
5b	Mixed mineral manures and ammonia salts (containing 50 lb. ammonia), with 2 tons lime November 1897	1,912	35·3	54·2	65	23	3	5	28	0	Much better than plot 2b
6	Mixed mineral manures and nitrate of soda (containing nitrogen = 50 lb. ammonia)	2,031	37·5	54·1	32	24	0	23	28	6	Inferior to plot 4, but better than plot 5b
7	Unmanured	780	15·3	51·0	19	9	1	21	29	6	Nearly equal to plot 1
8a	Mineral manures, ammonia salts (= 100 lb. ammonia) omitted (in alternate years, including 1898)	1,067	19·5	54·7	41	11	0	26	25	6	More even than plot 8b
8aa	Mineral manures, ammonia salts (= 100 lb. ammonia) omitted (in alternate years including 1898), with 2 tons lime November 1897	1,457	27·1	53·7	57	20	0	16	26	6	
8b	Mineral manures and (in alternate years, 1898 included) ammonia salts (= 100 lb. ammonia)	1,185	22·5	52·7	45	14	0	3	25	6	Not quite as good as plot 8bb
8bb	Mineral manures and (in alternate years, 1898 included) ammonia salts (= 100 lb. ammonia), with 2 tons lime November 1897	2,050	38·6	53·1	53	23	3	7	25	0	
9a	Mineral manures, nitrate of soda (containing nitrogen = 100 lb. ammonia) omitted (in alternate years, including 1898)	1,615	29·3	55·2	20	17	1	22	31	6	Not quite as good as plot 4, but is next best to it
9b	Mineral manures and (in alternate years, 1898 included) nitrate of soda (containing nitrogen = 100 lb. ammonia)	2,326	43·9	53·0	47	27	2	9	27	6	Not as good as plot 11b
10a	1889, rape cake (= 50 lb. ammonia). No manure since	754[1]	14·4[1]	52·5	37	10	2	3	31	6	Next to plot 9a
10b	Rape cake (= 100 lb. ammonia) every year since 1890	1,882	35·3	53·3	86	26	2	11	30	6	Better than plot 11b
11a	1877–81, farmyard manure (= 200 lb. ammonia). No manure since	1,075	20·5	52·5	26	12	2	10	31	0	
11b	Farmyard manure (= 200 lb. ammonia) every year	2,125	41·7	50·9	70	29	0	13	28	0	Grains large & well formed. Sample damaged in stack, or would have been better

[1] These plots (1 and 10a) were damaged by hares.

[2] Ammonia salts are equal weights of sulphate of ammonia and muriate of ammonia.

[3] Mixed mineral manures are, throughout, 3½ cwt. superphosphate of lime, 200 lb. sulphate of potash, 100 lb. sulphate of soda, 100 lb. sulphate of magnesia per acre.

The course of cropping for the last few years had been :—

Year	Rotation I.	Rotation II.	Rotation III.	Rotation IV.
1893	Seeds	Roots	Barley	Wheat
1894	Wheat	Barley	Seeds	Roots
1895	Roots	Seeds	Wheat	Barley
1896	Barley	Wheat	Roots	Seeds
1897	Seeds	Roots	Barley	Wheat

Taking the wheat crop as concluding the ordinary four-course rotation of roots, barley, seeds, wheat, Rotation IV., it will be seen, had come in 1897 to its natural conclusion; Rotation I. would reach this in 1898, Rotation III. in 1899. These were allowed accordingly to go on until this point would be reached. The difficulty was with Rotation II., the 5th rotation having concluded in 1896 and the 6th begun already, inasmuch as the roots grown in 1897 had been fed on the land with decorticated cotton cake and maize meal respectively. It was desirable, however, to avoid the recurrence of clover, and to bring Rotation II. into line with the others as early as possible. Accordingly, the barley of 1898 on Rotation II. was sown *without* clover, and the following cropping was arranged for :—

Year	Rotation I.	Rotation II.	Rotation III.	Rotation IV.
1898	Wheat	Barley	Seeds	Barley
1899	Barley	Barley	Wheat	Barley
1900	Barley	Barley	Barley	Barley

The crops of 1898 in this series were thus :—

Rotation I. Wheat, concluding the fifth complete rotation since the beginning (1877).
„ II. Barley, the second crop (following roots fed off the land), after the conclusion of the fifth complete rotation.
„ III. Red clover, the third crop of the fifth complete rotation.
„ IV. Barley (unmanured), the first crop after the conclusion of the fifth complete rotation.

The barley crop on Rotation IV. was the first crop taken, under the new plan, with a view to equalising the land for future experiment. It was unmanured throughout. The barley of Rotation II., on the other hand, received manure as usual from consumption of the roots with cake or meal as the case was. The wheat of Rotation I. followed on the previous clover, and red clover had been sown on Rotation III. among the barley crop of 1897.

Rotation I., 1898. *Wheat.*

The clover ley was ploughed up at the end of September 1897, and on October 13 the land was drilled with 8 pecks per acre of white-chaff Browick wheat. The wheat came up very evenly, and was very forward during the winter. There was no visible difference between the individual plots, and the two halves of the rotation—manured and unmanured—were much alike. Though the previous clover crop had been a very poor one in actual weight removed as hay, there was an even plant of it over the plots, and this had evidently the effect of producing, as had been noticed before, a nearly uniform crop of wheat over both halves. The crop stood up well, but was very late in ripening. It was cut on August 18, and carted on August 26. The results are given in Table III. (page 598).

Little need be said as to the individual plots, for the table shows that there was practically no difference between the several yields, nor between the plots of the upper half of the field (plots 1–4) manured last in 1896, and those of the lower half of the field (plots 5–8) which had received no manure since 1885 except such as they had derived from the growing of the clover crop. This affords striking proof of the effect of clover as a preparation for wheat, and the fact that no better return of wheat was obtained whether the highly nitrogenous decorticated cotton cake had been used for feeding off with the roots, or the less nitrogenous maize meal, or even no manure at all for the previous thirteen years, shows how great is the influence of the clover crop, and how impossible it was in these experiments to answer the question of the relative manurial values of the two foods, decorticated cotton cake and maize meal, so long as a clover crop would grow on the land.

As regards the *quality* of the corn, this was so alike on all the eight plots that no practical distinction could be drawn, and a general value of 27*s.* per quarter was assigned, this being the average adopted for this season.

Rotation II., 1898. *Barley.*

Here barley followed roots. The latter had been: on the upper half of the field (plots 1–4), swedes manured with 3 cwt. per acre of mineral superphosphate to ensure a crop, and a portion subsequently fed off with decorticated cotton cake and maize meal as described on Table III.; while on the lower half of the field (plots 5–8) mangels without manure had been grown and carted off entirely.

The crop of swedes on the upper half of the field in 1897

Table III.—*Rotation Experiments*, 1898.

Stackyard Field—Produce per acre.

Plot	Manures per acre	Rotation I.—Wheat							Rotation II.—Barley							Rotation III. Clover
		Head corn			Tail corn			Straw, chaff, &c.	Head corn			Tail corn			Straw, chaff, &c.	Weight of hay
		Weight	Bush.	Wght. per bush.	Weight	Bush.	Wght. per bush.		Weight	Bush.	Wght. per bush.	Weight	Bush.	Wght. per bush.		
		c. q. lb.		lb.	c. q. lb.		lb.	c. q. lb.	c. q. lb.		lb.	c. q. lb.		lb.	c. q. lb.	t. c. q. lb.
1	Roots fed off with sheep consuming 400 lb. decorticated cotton cake; 3 cwt. superphosphate to swedes . .	20 2 4½	37·0	62·2	0 3 13½	1·8	54·0	30 0 2	15 1 18	33·4	51·7	0 1 25	1·7	32·0	22 3 16	2 5 3 2
2	Roots fed off with sheep consuming 400 lb. maize meal; 3 cwt. superphosphate to swedes	20 1 11½	36·5	62·5	1 0 5½	2·2	54·5	29 2 12	12 3 11	26·7	53·8	0 2 19	2·1	35·5	19 1 18	2 3 1 6
3	Roots fed off with sheep without cake or meal; artificial equivalent of the cotton cake dung applied to succeeding barley; 3 cwt. superphosphate to swedes . .	20 0 16	36·2	62·3	0 3 10	1·7	56·0	27 1 2	14 2 10	30·4	53·8	0 2 19	2·1	36·0	22 0 15	2 6 2 0
4	Roots fed off with sheep without cake or meal; artificial equivalent of the maize meal dung applied to succeeding barley; 3 cwt. superphosphate to swedes . .	20 2 8	37·0	62·3	0 1 0½	0·6	48·0	27 1 26½	13 3 11	28·4	54·6	0 1 19	1·3	37·0	17 1 1	2 9 1 6
5	No manure (cotton cake plot) . .	19 3 15½	35·7	62·4	0 3 0	1·6	54·0	27 1 21½	7 2 5	16·2	52·2	0 2 5	1·7	37·0	11 0 19	1 13 1 10
6	No manure (maize meal plot) . .	21 2 15½	39·2	61·8	0 1 16	0·8	53·0	30 1 1½	7 3 5	16·6	52·5	0 2 2	1·6	37·0	11 3 4	1 12 1 20
7	No manure (artificial equivalent of cotton cake dung plot)	19 1 14½	35·2	61·7	0 1 20½	0·9	53·0	25 3 20	9 1 8	19·6	53·4	0 1 23	1·4	36·0	12 0 16	1 9 0 4
8	No manure (artificial equivalent of maize meal dung plot)	19 3 16½	36·1	61·7	0 1 4½	0·7	49·0	26 2 7½	10 2 17	22·0	54·2	0 1 23	1·3	38·0	13 1 3	1 8 1 26

was slightly over 14 tons of roots per acre. Of these, $7\frac{1}{2}$ tons per acre were removed from each plot, as well as the whole of the leaves, and the remainder was fed on, along with 240 lb. per acre of hay chaff, as follows :—

Plot 1, with 400 lb. decorticated cotton cake per acre.
„ 2, „ „ maize meal per acre.
„ 3 and 4, without purchased food, but to the following barley artificial manures estimated to be equivalent to the cotton cake and maize meal dung respectively were applied.

The manures applied to the barley on plots 3 and 4 were :—

Manures per acre	Plot 3	Plot 4.
	lb.	lb.
Bone-ash superphosphate	40	$6\frac{2}{3}$
Sulphate of potash	25	$2\frac{4}{5}$
„ „ magnesia	26	$4\frac{2}{7}$
Nitrate of soda	178	$34\frac{1}{2}$

The mangel crop of 1897 was exceedingly small, amounting on the average to only a little over 3 tons of roots to the acre, and these, together with the leaves, were removed entirely on October 16.

The swedes were fed off between December 6 and 31, 1897, and the whole rotation was ploughed as soon as the sheep were off. A second ploughing was given on February 18, 1898, the land then scuffled on February 21, and drilled with barley ("Golden Melon") at the rate of 8 pecks per acre on February 24 and 25. Mineral manures were put on plots 3 and 4 on April 26, and nitrate of soda top-dressed on these plots on May 6. Clover was *not* sown this time among the barley.

It was noticed during the period of growth that all the upper plots (1–4) were markedly better than any of the lower half (plots 5–8), and that plot 1 (cotton cake) was much better than plot 2 (maize meal), as also plot 3 (equivalent of cotton cake dung) better than plot 4 (equivalent of maize meal dung). These observations were borne out in the produce, as shown in Table III., page 598. The barley was cut on August 30, and carted on September 2.

The results bore out what had all along been noticed, viz., that in the barley crop immediately following the use of decorticated cotton cake or maize meal or their equivalents in artificial manures the influence of the manurings is clearly seen, cotton cake giving results superior to maize meal. Thus, cotton cake gave 33·4 bushels of corn as against 26·7 bushels with maize meal, and the artificial equivalent of cotton cake dung gave 30·4 bushels as against 28·4 bushels with the artificial equivalent of maize meal dung.

TABLE IV.—*Rotation Experiments*, 1898. *Rotation IV.—Barley.*

Stackyard Field—Produce per acre.

Plot		—	Head corn: Weight c.	q.	lb.	Head corn: Bushels	Head corn: Weight per bushel lb.	Tail corn: Weight c.	q.	lb.	Tail corn: Bushels	Tail corn: Weight per bushel lb.	Straw, chaff, &c. c.	q.	lb.	Value per quarter on basis of 29s. per quarter s.	d.
Manured until 1895—once in the rotation—by feeding off roots with decorticated cotton cake dung and maize meal dung respectively.	1	No manure (cotton cake plot)	9	2	5	21·3	50·1	0	2	0	1·6	35·0	13	1	0	26	6
	2	No manure (maize meal plot)	10	2	27	23·2	51·9	0	2	10	1·7	39·0	14	3	22	26	6
	3	No manure (artificial equivalent of cotton cake plot)	11	2	16	24·8	52·5	0	2	15	1·7	41·0	14	3	20	27	0
	4	No manure (artificial equivalent of maize meal plot)	11	0	13	23·8	52·4	0	2	7	1·7	38·0	14	0	2	27	0
Unmanured since 1885	5	No manure (cotton cake plot)	9	3	3	20·2	54·2	0	1	20	1·3	38·0	11	1	7	28	0
	6	No manure (maize meal plot)	10	1	2	21·3	53·9	0	2	12	1·7	40·0	12	3	10	28	0
	7	No manure (artificial equivalent of cotton cake dung plot)	10	0	7	21·2	53·1	0	1	20	1·5	33·0	13	1	6	27	6
	8	No manure (artificial equivalent of maize meal dung plot)	10	1	25	22·1	53·1	0	1	15	1·2	35·0	12	2	10	27	6

The unmanured plots 5–8 gave an average yield of only 18·6 bushels of corn.

As regards the values assigned to the various plots, it was noticeable that the manured plots (1–4) were generally better than the unmanured (5–8), though they did not differ widely among themselves. Table V. gives the respective values.

TABLE V.—*Rotation II.*, 1898. *Barley—Valuation of Corn.*

Plot	Manures	Value per qr. s.	d.	Remarks
1	Cotton cake plot	31	0	All very good samples
2	Maize meal ,, ...	32	0	
3	Artificial equivalent of cotton cake dung plot	32	6	
4	Artificial equivalent of maize meal dung plot	33	0	Decidedly the best
5	No manure (cotton cake plot) .	28	0	Much the worst quality
6	,, ,, (maize meal plot) . .	30	0	—
7	,, ,, (artificial equivalent of cotton cake dung plot) . .	30	6	—
8	No manure (artificial equivalent of maize meal dung plot) . .	31	0	Nearly as good as plot 1

Rotation III., 1898. *Red Clover.*

Red clover had been drilled on May 13, 1897, at the rate of 15 lb. per acre, between the barley rows of that year. It failed in patches over the plots, and rather more so on the unmanured plots (5–8) than on the upper ones (1–4). It was cut twice for hay, viz., on July 1, 1898, and September 3, 1898. The results are given in Table III.

The produce of the manured plots was, on the average, 15 cwt. per acre better than that of the unmanured ones, but there was no marked difference in favour of cotton cake as against maize meal.

Rotation IV, 1898. *Barley after Wheat.*

This was the first year of the fresh alteration in plan, barley being now taken at the close of the 5th complete rotation with a view to equalising the land for future experiment. After removal of the wheat crop of 1897, the land was scuffled on August 30, 1897, ploughed on October 5, ploughed again on March 14, 1898, and barley ("Golden Melon") at the rate of 8 pecks per acre was drilled on March 21 without any manure whatever. The crop was thin and weedy, and ripened very unevenly, especially on the lower half of the field (plots 5–8).

The barley was cut on August 31 and carted on September 2. The results are given in Table IV. page 600.

The yields of the different plots did not vary greatly; the upper and previously (until 1895) manured ones gave, on the average, 2 bushels per acre more corn than the lower plots (5–8) which had received no application of manure since 1885. Here, however, there were again no differences brought out as between the use of cotton cake and of maize meal. These upper plots (1–4) did not give quite so good a quality of barley as did the others, but the corn generally was inferior to the barley on Rotation II. this same year.

The barley crop, it was once more shown in these rotation experiments, is the only one in the rotation that shows any marked difference between the manurial value of decorticated cotton cake and that of maize meal, so long as a clover crop is grown. In the clover crop itself there may be a slight difference between the manured and unmanured portions, but not between the cotton cake and the maize meal plots, and, when the succeeding wheat crop comes, any differences are, for practical purposes, once more equalised.

C. ROTATION EXPERIMENTS (*Lansome Field*).

1898. *Clover*.

These experiments were a continuance of those in Stackyard Field on the comparative manurial values of decorticated cotton cake and maize meal. These materials were, in the present instance, not only given as food to sheep eating off the roots, but were also used directly as manure by being spread on the land for the barley crop after the roots had been fed off. The crop of 1898 was red clover. This had been drilled at the rate of 15lb. per acre among the barley on May 10, 1897. The clover grew uncommonly well, but throughout the winter it was badly attacked by mildew, and died off a good deal. It was cut twice for hay, viz. on July 3 and September 3. The weights are given in Table VI.

TABLE VI.—*Rotation Experiments, Lansome Field,* 1898.

RED CLOVER—produce of clover hay per acre.

Plot	After barley—manures used for barley only	Weight of clover hay			
		t	c.	qr	lb
1	Unmanured plot	2	10	2	24
2	Decorticated cotton cake dung plot	2	9	0	16
3	„ „ „ meal (as top-dressing) plot	2	7	2	16
4	Unmanured plot	3	17	1	12
5	Maize meal dung plot	3	7	1	12
6	„ „ (as top-dressing) plot	3	19	2	8

The worst affected plots were 2 and 3, on which decorticated cotton cake had been used, and, on account of the loss of clover, the results given above afford really no indication of the relative efficiency of the materials.

D. ON THE PERMANENCE OF RYE GRASS (*Stackyard Field*), 1898.

Four small plots were sown in 1893 as follows:—

Plot 1. "Small-seeded" rye-grass	Plot 3. "Italian" rye-grass
„ 2. "Perennial" „	„ 4. "Annual" „

They each received yearly a manuring of 5 cwt. per acre of damaged decorticated cotton cake meal, the crop being hayed each time. The object of the experiment was to see how long each variety would keep its character, and if there was any real difference between the so-called "perennial" varieties and the others. By 1898 the plots had all become so impure through the intrusion of other grasses, clovers and weeds, that they could no longer be considered representative, and the weights were not taken this year. So far as any conclusion could fairly be drawn, it was to the effect that the "Annual" and "Italian" had quite disappeared, while the "small-seeded" and "perennial" were certainly more permanent in character, and still formed a proportion of the pasture.

E. EXPERIMENTS ON THE GROWING OF LUCERNE (*Stackyard Field*), 1898.

In 1889 on a strip of land which had become "clover-sick" through frequent repetition of clover, lucerne was tried experimentally. Seven small plots were marked out and differently manured, lucerne seed being drilled in May 1889. The lucerne flourished from the commencement, and has, up to the present, required no re-sowing.

The manures, as set out in Table VII., were applied each year to see if any of them increased the produce or prolonged the duration of life.

Three cuttings, and sometimes even four, have been obtained annually, and in each case were weighed green.

For the first seven years (1889–95) the manures showed no benefit, while sulphate of ammonia distinctly reduced the produce.

From 1896 onwards there has, however, been a distinct

change, the application of sulphate of potash, or of manures containing it, having shown a marked increase. This is exemplified in the crops of both 1897 and 1898, which are set out in Table VII.

TABLE VII.—*Lucerne. Stackyard Field.*

Green produce per acre. 1897 and 1898.

Plot	Manures per acre, applied annually	1897 Green produce[1]				1898 Green produce[1]			
		t.	c.	qr.	lb.	t.	c.	qr.	lb.
1	No manure	14	19	1	6	8	17	1	4
2	Superphosphate, 4 cwt.; bone dust, 4 cwt.	15	19	2	3	8	9	3	14
3	Sulphate of potash, 4 cwt.	17	5	0	16	12	2	2	20
4	Sulphate of ammonia, 2 cwt.	12	2	2	20	8	0	1	21
5	Nitrate of soda, 2 cwt.	17	3	0	14	11	1	0	12
6	Superphosphate, 4 cwt.; bone dust, 4 cwt.; sulphate of potash, 4 cwt.; sulphate of ammonia, 2 cwt.	22	1	2	4	16	11	2	18
7	Superphosphate, 4 cwt.; bone dust, 4 cwt.; sulphate of potash, 4 cwt.; nitrate of soda, 2 cwt.	23	18	2	13	16	7	2	13

It will be seen that plots 6 and 7 now give decidedly the highest crops, that the next best is plot 3 (sulphate of potash), while sulphate of ammonia used alone (plot 4) has had a contrary effect.

F. ON LATHYRUS SYLVESTRIS AS A FODDER CROP (*STACKYARD FIELD*), 1898.

This plant, first sown in 1890, continues to thrive, and though during each winter it seems to disappear, it comes up again strongly in spring, and smothers the weeds.

Though found to be practically useless as a feeding material, owing to stock not caring for it, as the plot is in the field the weights of green produce are still recorded yearly.

In 1897 and 1898 the weights of green produce per acre were:—

1897	6 tons	5 cwt.	0 qr.	0 lb.
1898	4 „	15 „	3 „	26 „

One cutting only was obtained in each of these two years.

[1] Three cuttings.

G. EXPERIMENTS ON GREEN-MANURING (*Lansome Field*), 1898.

Since 1892, experiments have been in progress with a view to ascertaining whether the ploughing-in of a leguminous green crop like tares is superior in its effect on a subsequent corn crop to a non-leguminous crop, like mustard or rape, similarly ploughed in.

Green crops of each of the above (tares, mustard, rape) were ploughed in (two successive crops of each) during 1892, 1894, 1896, and 1898, barley following in 1893 and 1895, and wheat in 1897 and 1899.

The experiment is hardly sufficiently complete as yet to report upon it fully, but it may be said that, so far, no superiority has been found to accrue to the ploughing in of a leguminous as against that of a non-leguminous crop.

H. EXPERIMENTS ON PASTURE, 1898.

1. *Great Hill Bottom.*

This field was laid down in 1896 with different seed mixtures. The records up to 1895 are given in Journal R.A.S.E., Vol. III., Part IV., 1897, p. 645. In 1896 and since the whole area has been grazed.

2. *Broad Mead.*

Manurial experiments were commenced in this field in 1893. The report in Journal R.A.S.E., Vol. VIII., 1897, p. 646, gives the results up to 1896 inclusive. The manures, which had been put on yearly up to 1896 inclusive, were now omitted. In 1897 the plots were mown: the results are given in Table VIII.

Table VIII.—*Grass Experiments. Broad Mead.*

Produce of Hay, 1897.

Plot	Manures per acre until 1896	Weight of hay per acre			
		t.	c.	qr.	lb.
1	Gypsum, 5 cwt.	2	6	2	0
2	Basic slag, 8 cwt.	2	6	0	0
3	Mineral superphosphate, 3 cwt.	2	1	0	0
4	No manure	2	12	2	0
5	Lime, 2 tons	2	14	2	0

Lime, it will be noticed, has now begun to show an improvement in the crop produce, though it had already for some time

been observed that the lime plot was the greenest and freshest herbage, and was most liked by stock. Basic slag seems to have been of little use on this land.

In 1898 the plots were all grazed.

J. EXPERIMENTS ON THE PREVENTION OF "POTATO DISEASE," 1898 (*WARREN FIELD*).

These experiments, conducted yearly since 1892, were continued in 1898, the field then used being "Warren Field."

Four varieties of potatoes were tried, viz.: "Early Market" (an early variety), "Cole's Favourite" (second early), "Challenge" (second early), and "Up-to-Date" (main crop).

Planting began on April 19, 1898, the land being bouted up and farmyard manure spread on.

On July 27 the crop was sprayed with "Bouillie Bordelaise" mixture, this being in the proportions of

Sulphate of copper	20 lb.
Lime	20 „
Water	100 gallons.

Several thunderstorms followed the spraying, and, accordingly, the plants were sprayed again on August 5. The season was an exceedingly dry one, and there was very little disease. At the same time there was a distinct difference in appearance between the leaves of the plants that had been sprayed and those that had not, the sprayed plants remaining green longer, while the leaves of the unsprayed plants appeared to be affected by disease.

The results are given in Table IX.

TABLE IX.—*Experiments on the Prevention of "Potato Disease."*
Warren Field, 1898.

Plot	Variety	Treatment	Sound potatoes per acre				Diseased potatoes per acre	
			t.	c.	qr.	lb.	qr.	lb.
1a	"Early Market" .	Sprayed .	8	19	0	22	1	2
1b	„ „	Not sprayed	8	4	1	7	3	25
2a	"Challenge" .	Sprayed .	9	4	0	8	none	
2b	„	Not sprayed	8	17	3	26	„	
3a	"Cole's Favourite"	Sprayed .	9	8	0	0	„	
3b	„ „	Not sprayed	8	0	1	9	„	
4a	"Up-to-date" .	Sprayed .	12	11	0	0	„	
4b	„	Not sprayed	12	3	0	26	„	

Each variety, it will be seen, gave a higher produce on the sprayed plots than on the unsprayed. It should, however, be remarked that the increase in the case of the sprayed plot of "Cole's Favourite" is not entirely due to the spraying, but partly also to the fact that some of the seed was not true, but included some "Up-to-Date," which, being a heavier "cropper" than "Cole's Favourite," somewhat exaggerated the difference in weight.

The "Up-to-Date," on the other hand, should have shown a greater difference than was here the case, for the sprayed plot included in its area a weak spot of the field where the crop was manifestly inferior to the rest. Taking everything into consideration, however, the results confirmed the observations made in previous years, that, even when little or no disease is prevalent, the spraying produces a heavier yield of crop.

K. EXPERIMENTS ON THE CURE OF "FINGER-AND-TOE" IN TURNIPS, 1898 (*Great Hill*).

Since 1896, experiments, with a view to seeing whether any application of manures or chemical agents to the land would succeed in stopping the ravages of "Finger-and-toe," have been in progress at the farm. These were continued in 1898, and are still going on. The full consideration of this subject will receive separate treatment later on.

Rainfall at the Woburn Experimental Farm in 1898.

	in.		in.
January	·68	July	2·41
February	·75	August	2·80 [1]
March	1·44	September	·37
April	1·33	October	2·37
May	3·43	November	1·68
June	1·71	December	2·56
		Total	21·53

J. AUGUSTUS VOELCKER.

[1] On August 6, between 7.0 a.m. and 1.55 p.m., 1·75 in. of rain fell.

LIGHTNING AND ITS EFFECT ON TREES

The recent damage to beech trees at Belvoir Castle and at Harlaxton Manor, a full account of which was contained in the report of the Consulting Botanist, dated July 25, 1899,[1] calls attention, and that in a very singular manner, to one of the varying effects of the lightning stroke. It is stated:—

> The greater number of the injured trees presented the appearance of dead tracts of bark and wood from eight to twelve inches wide, running for a long way down the stem of the tree. The bark had begun to crack and fall off. The wood exposed below was hard and dead, and cracked with numerous shallow fissures. It was not injured by fungi. Along the edges of the injured track the uninjured bark and stem were developing a healthy and vigorous callus, which was gradually covering the dead wood and repairing the injury. This thickening callus assisted in pushing off the dead bark. . . The injury to these trees was certainly not caused by any living organism, plant or animal; it must have had a physical origin. It seems to me to have been caused by lightning, the electricity as it passed down the stem having killed the active tissues between the bark and the wood along the trail it followed.

That the beech should in this case have been selected by the lightning flash is perhaps a little singular when we consider how large a degree of immunity that species usually enjoys from such attacks. More than a hundred years ago Mr. Hugh Maxwell, of Massachusetts, called attention to the fact that while lightning often strikes the elm, the chestnut, and every species of oak and pine, it rarely if ever attacks the beech, the birch, or the maple. Sixty years later, in a paper read before the American Association for the Advancement of Science, Professor Olmstead of Yale College remarked that in the southern part of the United States there was an impression that the pine was more apt to be struck by lightning than other trees. In commenting upon this Professor Elias Loomis, one of the greatest of American meteorologists, stated that in Ohio there was a common belief that the beech was never struck, although he had knowledge to the contrary, a fact since made clear by common experience, and very recently, as we have seen, by the condition of the trees at Belvoir and Harlaxton.

So far as our own country is concerned the data available

---

[1] Journal R.A.S.E., 3rd series, vol. x. (Part iii.), 1899, Appendix, p. lxxxiii.

for proving or disproving the notion appear to be miserably small, the reports of damage done to trees by lightning containing as a rule no precise statement as to the kind of trees affected. In a limited degree, however, the information seems to support the view originally put forth by the American observers. Mr. G. J. Symons, in a paper read at the Oxford meeting of the British Association, stated that out of sixteen trees struck in the years 1857–69 six were elms, the others being oak, ash, and poplar. Subsequently, in a paper on the thunderstorms of July to September 1884 [1] the same writer stated that out of eighteen trees struck, and the species of which were recorded, six were ash, five elm, four oak, and one each plane, poplar, and willow. Therefore, says Mr. Symons, "the sequence, reckoning from the oftenest struck, is:"—

Maxwell, Elm, chestnut, oak, pine, ash.
Symons (in storms of 1857–69), Elm, oak, ash, poplar.
Symons (in storms of 1884), Ash, elm, oak, plane, poplar, willow.

In Germany, where matters connected with forestry receive far more attention perhaps than in any other country, the damage occasioned by lightning has been recorded with a degree of fulness yielding very interesting results. The most important observations at present available were instituted by the German Government in 1875, and were made by the overseers of nine forestry stations scattered throughout an area of about 45,000 acres in the Dukedom of Lippe. The results of the inquiry, originally published in Germany, have recently been set forth by the Weather Bureau of Washington in a valuable little work entitled "Lightning and the Electricity of the Air," from which we venture to extract the two following tables. It may in the first place be observed that the percentage of the various species of trees of which the forest is composed is approximately as follows,—beech 70 per cent., oak 11, pines 13, and firs 6.

Number of Trees struck by Lightning.

Variety	1879	1880	1881	1882	1883	1884	1885	1890	Total
Oak	17	45	11	9	4	40	27	6	159
Beech	7	4	1	1	—	6	2	—	21
Pine	6	3	1	—	—	4	3	3	20
Fir	9	11	—	—	—	23	11	5	59
Birch	—	1	—	—	—	2	1	—	4
Larch	—	2	—	—	—	1	4	—	7
Ash	1	1	—	—	—	2	1	—	5

[1] Symons's Monthly Meteorological Magazine, Vol. xix. p. 159.

From these figures it would appear that out of 275 trees struck no fewer than 159, or 58 per cent, were oaks, and 59, or 21 per cent., firs. Only 21, or 8 per cent., were beeches, and only 20, or 7 per cent., pines, the amount of damage sustained by other varieties being still smaller.

If, says the memoir in question, the liability of the beech to lightning stroke be considered as 1, we obtain for the remaining principal varieties the values shown in the following table:—

Liability to Lightning Stroke of the Oak, Pine, and Fir (*Beech*=1).

Variety	1879	1880	1881	1882	1883[1]	1884	1885	1890[2]
Beech . .	1·0	1·0	1·0	1·0	—	1·0	1·0	—
Oak . . .	15·5	71·6	70·0	57·3	—	42·4	85·9	—
Pine . . .	4·6	4·0	5·4	—	—	3·6	8·1	—
Fir . . .	15·0	32·1	—	—	—	44·7	64·2	—

[1] Only oaks struck in this year. [2] No beeches struck.

The above figures undoubtedly show that the liability of the oak to lightning stroke is always many times greater than that of the beech, and that it varies considerably from year to year.

In order to discover if possible the cause of the singular partiality shown by the lightning stroke for certain kinds of trees, a series of elaborate experiments were undertaken in the years 1890–92 by Mr. Dimitrie Jonesco in Stuttgart. The first object of these experiments was to determine if possible the different degrees of conductivity possessed by various kinds of wood, and as a result it was found that oak formed a far better medium for the passage of the electric fluid than the beech or some other species of trees. It was at first thought quite possible that the higher degree of conductivity might in some way be dependent upon the amount of moisture in the wood, the degree of percentage in freshly cut specimens being black poplar 51·8, beech 39·7, and oak 35·4. Further researches showed, however, that the power of conducting electricity was due not so much, if at all, to the presence of moisture, as to the amount of fatty material. In trees rich in fatty material, the conductivity was small, while in trees poor in fatty but rich in starchy material, it was large, the actual degree of difference varying, nevertheless, greatly with different kinds of wood. According to other investigators the quantity of oil and starch in the wood differs with the time of year. The results obtained in this line of inquiry are of sufficient interest to justify a more lengthy quotation, our

authority in this case being again the very valuable pamphlet recently issued by the United States Weather Bureau. The latest researches of the German investigators show that—

it is possible to distinguish between (1) trees whose wood is always rich in fatty material, for example, walnut and beech; (2) trees whose wood in summer is deficient in fatty material, as the pine; and finally (3) trees whose fatty contents are intermediate between those of classes 1 and 2, their fatty contents in winter falling below those of No. 1, and in summer rising considerably above those of class No. 2. Trees rich in fatty material in summer appear to possess a high degree of immunity from lightning stroke, those richest in oil having the greatest immunity. On the other hand, trees deficient in fatty materials during the thunderstorm season, as also the trees rich in starch, are preferred by the lightning. The fact that lightning in winter thunderstorms is rarely observed to strike trees is explained on the ground that the wood of most of our cultivated trees is rich in oil during winter. As a check upon his work Jonesco took the wood of typical trees rich in fatty materials—beech and walnut—and found after depriving them of their oil by means of ether that the conductivity was increased and became practically the same as that of typical trees rich in starchy material.

An inquiry into the actual effect of the lightning stroke upon different kinds of trees shows that the beech is not only fortunate in escaping the attacks of the electric fluid, but that when it is struck the damage done is as a rule far less serious than that sustained by many other species. A shattered beech tree is, in fact, a rare spectacle, the effect of the lightning being usually confined, as at Belvoir, to the ploughing of longitudinal furrows down the stem, reaching, in some cases but not always, to the surface of the ground. The comparatively harmless effect of the lightning stroke upon the beech, and, in fact, upon other trees of a similar kind, is accounted for rather plausibly, if not quite satisfactorily, by an American writer, who suggests that the bark of the tree, being so smooth, is covered by the thunder rains with a film of water, along which the electrical discharge runs with little or no damage to the tree itself. In trees with a rougher bark—such, for instance, as the oak—the passage of the lightning flash is interrupted, and the damage done is therefore far more extensive. The oak has, in fact, the misfortune not only to be struck more frequently perhaps than any other tree, but to suffer a greater amount of damage when it is thus selected. On this subject Mr. Symons has remarked quite recently: "It is easy for any one, who hardly knows an oak when he sees it growing, to pick out from a series of photographs of trees struck by lightning all the oaks," the trees selected being of course those in which the damage is most extensive. Two illustrations of the serious injuries

not uncommonly sustained are shown in figs. 1 and 2.[1] The first case occurred at Thornbury, Gloucestershire, on July 22, 1891. The second was a most peculiar occurrence. The tree, situated at Old Farm, Sachel Court, 4 miles south-

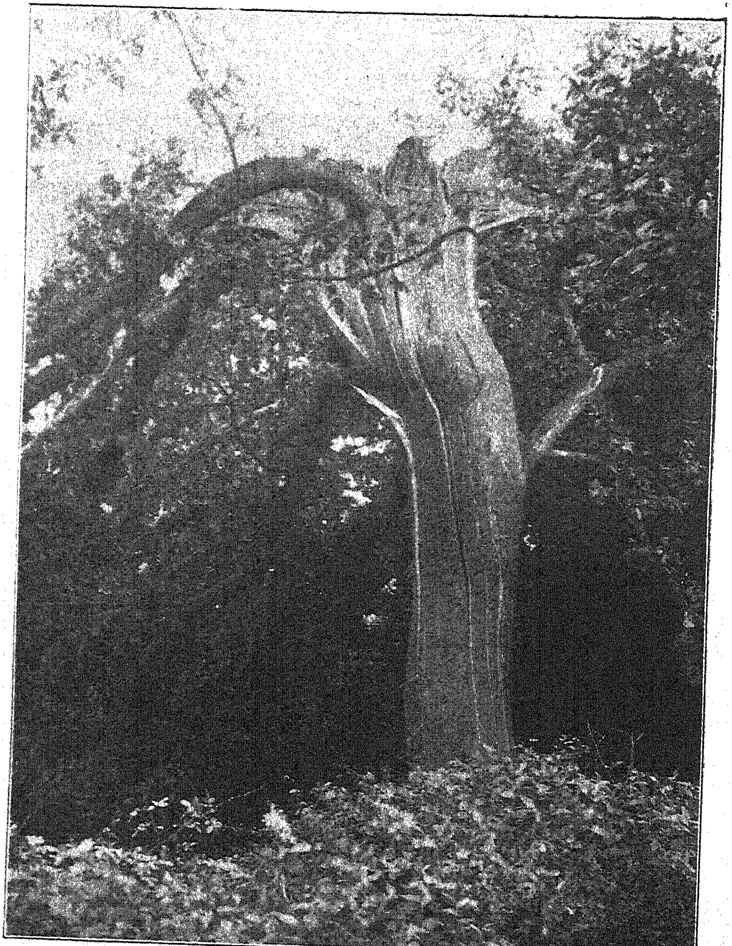


FIG. 1.—Tree struck by lightning at Thornbury, Gloucestershire, July 22, 1891.

west of Cranleigh in Surrey, was struck in the first instance on June 6, 1889. Next day it again had the misfortune to

[1] These illustrations are reproduced by permission from photographs in the possession of the Royal Meteorological Society.

attract the electric current, and in this case it was, as the illustration shows, pretty completely shattered. In some cases a tree struck by lightning is simply decapitated, this

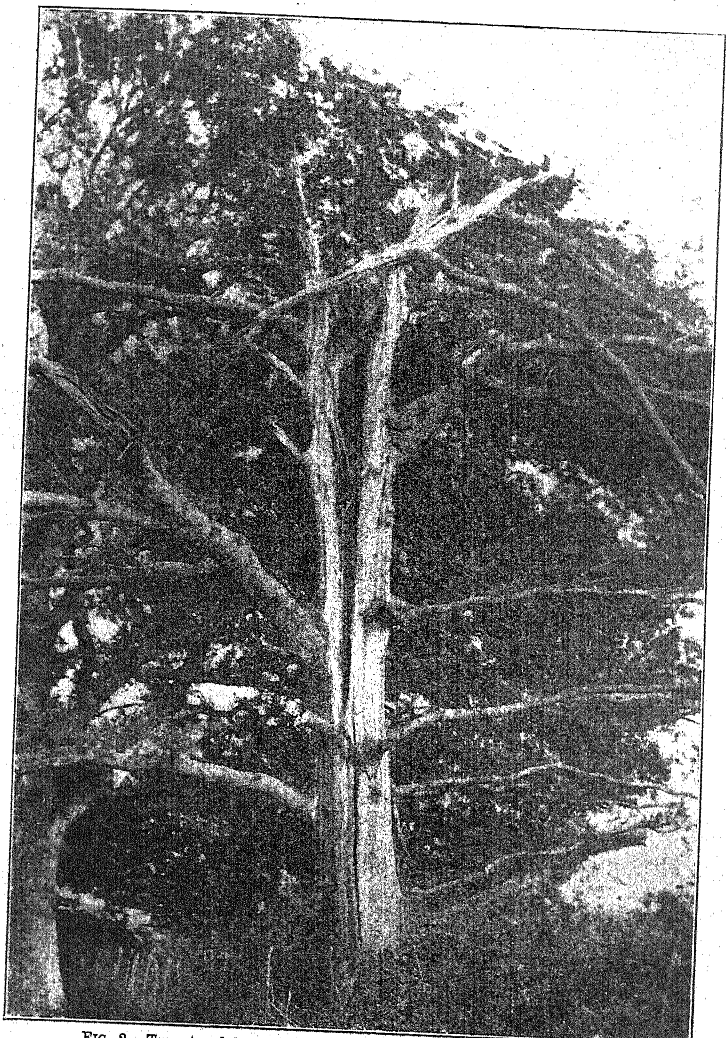


FIG. 2.—Tree struck by lightning at Sachel Court, near Cranleigh, Surrey, on June 6, and again on June 7, 1889.

species of injury suggesting the occurrence of a flash proceeding in a more or less horizontal direction. Against this idea,

however, we may set the fact that in many instances no damage is done to trees in the immediate neighbourhood, which one would have thought would certainly have lain in the path of the lightning stroke.

The selection shown by lightning in its passage to the ground seems, in short, to be most erratic, and incapable at present of any theory of explanation. As a rule, the electric current chooses of course some object which is high and prominent, and for this reason our lofty buildings are furnished with lightning conductors; an excellent means of protection when the conductor is efficient and in good order, but a very ready source of mischief in cases where the conductor has been improperly or ignorantly attached. It is, however, not always that the lightning, in its erratic course, selects any prominent object at all. The tree in a thick wood that suffers injury is no more exposed than its fellows, and even when situated in a more open situation it is not always the most lofty tree that is attacked. In some instances, as the one we have just quoted at Cranleigh, an unfortunate tree becomes the victim of more than one attack while all its fellows escape.

In America much damage to live stock by lightning is believed to have arisen from the increasing adoption of wire fences. The director of the Iowa Weather and Crop Service, in his report on the thunderstorms of 1898, remarks: "Unquestionably wire fences, as now constructed, serve as death traps to live stock, causing a vast amount of loss every year. And it is also quite evident that a considerable percentage of danger may be avoided by the use of ground wires at frequent intervals in the construction of wire fences." Emphasising this, the author of the Weather Bureau pamphlet says, "The subject should receive immediate attention. Nearly one third of all the cases of damaging lightning stroke, in the fields, occurred in the immediate vicinity of wire fences." The point appears to be a practical one, deserving the notice not only of American but of English farmers, the means of protection from a real source of danger being after all very simple.

The action of lightning is so uncertain that it is, we need hardly say, altogether foolish to attempt to elude it, as some nervous individuals do. There are, however, precautions that may wisely be taken during the prevalence of a severe thunderstorm. Experience shows that it is unwise to stand in the doorways of barns, close to cattle, or near chimney and fire places. To take refuge under a tree is, as most people are aware, a very risky proceeding, but if it must be done we should certainly select a beech, or in fact any tree with a

smooth bark, in preference to one such as the oak, which possesses such an unenviable notoriety for attracting the lightning flash.

More than 20 years ago the subject of lightning conductors and their efficiency was very thoroughly considered by a committee of delegates appointed respectively by the Royal Meteorological Society, the Royal Institute of British Architects, the Society of Telegraph Engineers and of Electricians, and the Physical Society, with two co-opted members, Fellows of the Royal Society. The labours of this distinguished and very representative committee resulted in the framing of a series of practical rules for the protection of buildings from lightning, and their report contains a large mass of information bearing upon the subject from almost every point of view. In a general way, it may be said that the attention devoted in this country to the study of thunderstorm phenomena has been very small in comparison with that bestowed upon it in some parts of the continent and especially in Italy. A thunderstorm committee of the Royal Meteorological Society issued some ten years ago a report on the relative prevalence of storms in different parts of the country. The results were, however, given for districts and not for individual places, and, as the number of observers in some of these was far larger than in others, there was a tendency for undue weight to be given to the frequency of thunderstorms in districts in which the observers were the more numerous. With so many fishers at work, more fish were naturally caught, and the results were not strictly comparable. To deal with the matter satisfactorily it is necessary to use the reports made at individual stations, and for the purposes of the present inquiry I have therefore selected observations made at 14 stations fairly well scattered over various parts of England and Wales, and have extracted from them the number of thunderstorms reported during the 15 years 1881 to 1895. The summer half of the year has alone been considered, for over England the winter thunderstorms are so rare that they may be regarded almost as non-existent. Within recent years the most striking instance perhaps of a winter thunderstorm occurred on January 23, 1895, when a very sharp one originating over our northern counties moved almost due south across the eastern and south-eastern districts, and caused in some cases a considerable amount of damage. Out on our west and north-west coasts thunderstorms in winter are by no means rare, the more general cases occurring during the passage of large cyclonic disturbances. In extracting the thunderstorm observations for the purposes of the table I have included all cases in which thunder was

heard but no lightning seen. Observations of sheet lightning have however been rejected, the latter being often the reflection of a storm at a very long distance from the station itself. The values given in the table are the average results for the fifteen years.

Table showing for 14 stations, situated in various parts of England and Wales, the average number of days with thunderstorms during the summer half-year (April to September).

Stations	April	May	June	July	Aug.	Sept.	The entire six months
York	1·1	2·6	1·7	3·4	2·0	0·8	11·6
Cambridge	0·9	2·7	3·2	3·7	2·5	1·3	14·3
Yarmouth	0·5	1·5	2·1	3·2	2·5	0·6	10·4
Loughborough	1·0	1·9	2·3	3·5	2·4	0·7	11·8
Churchstoke (Montgomeryshire)	0·7	1·9	2·2	2·4	1·9	0·7	9·8
Cheltenham	1·3	1·9	2·3	2·3	2·0	0·9	10·7
Oxford	0·6	1·7	2·6	2·4	1·8	0·9	10·0
London	1·1	1·9	2·2	3·3	2·1	1·2	11·8
Dungeness	0·2	0·8	1·1	2·3	1·5	0·8	6·7
Southampton	0 7	0·9	1·3	1·9	1·5	0·8	7·1
Stonyhurst	1·2	2·5	2·5	3·7	2·5	1·7	14·1
Llandudno	0·4	1·0	0·9	0·7	0·8	0·4	4·2
Pembroke	0·1	0·2	0·3	0·3	0·1	0·3	1·3
Scilly (St. Mary's) . . .	0·2	0·3	0·3	0·9	1·0	0·4	3·1

The figures in the table show that, in this country at all events, thunderstorms are far more common in July than at any other time of the year, the heavy showers by which they are in many cases accompanied leaving a very perceptible mark on the statistics relating to rainfall. In some parts of our eastern counties the average rainfall in July is as a matter of fact greater than in any other month, while in many other places, such for example as London, Oxford, and York, it is exceeded only by the rainfall of October. Next to July the chances in favour of a thunderstorm appear to be almost equally divided between May, June, and August. In April and September the number of storms is apparently only half as great as in May, less than half as great as in June and August, and less than one third of the number experienced in July. In all parts of the country the tendency to thundery weather is far greater at inland stations than at places situated on the coast. At Cambridge, for example, the average number of summer thunderstorms is 14, or 4 more than at Yarmouth, while in London the average number, 12, is 5 in excess of that recorded at Dungeness. At Llandudno there are during the summer months only four thunderstorms, and at St. Mary's, Scilly,

three, while at Pembroke the average number is little over one. The presence or absence of thundery weather in summer time appears to depend very little upon the height of the thermometer. The old definition of an English summer as consisting of three hot days and a thunderstorm is, in fact, not supported by scientific observations. In many recent years the number of thunderstorms reported has been larger in cool than in warm seasons. Given a very disturbed state of the atmosphere, thunderstorms may always be expected in the summer time, whether the thermometer be high for the time of year or low.

FREDERICK J. BRODIE.

Wandsworth Common.

THE THINNING AND PRUNING OF FOREST AREAS.

AMONG the many points at issue in arboriculture—or forestry, as tree culture is now usually termed—there is not one upon which practical men differ more than that of pruning. I am not alluding, of course, to simple lopping, which implies unskilful pruning; but to pruning exercised as an art. The object of pruning is to balance the tree and to assist in the development of the longest and straightest stem possible to produce the maximum of timber. Further than this, it eradicates almost entirely the rotten holes so injurious to the well-being of the future timber; where branches growing from the stems —*i.e.* limbs great or small—die from want of light and air, the dead limb will absorb moisture and soon become a channel conveying water to the trunk. It is these cavities so created, and extended by time, that go far to render our home-grown timber defective. When woods and plantations are so fully stocked that natural pruning becomes effective, no artificial removal of limbs and branches need be resorted to; in fact, to prune under such conditions might well be considered both superfluous and unwise.

The under branches, *i.e.* those beneath the top canopy, will die when deprived of light, air, and moisture, and Nature will in due course cover the wound. In this way a long and branchless bole is built up, which by and by will bring both money and credit to the grower. There may be occasions—in fact there often are—when Nature may need assistance, as will

be shown hereafter by illustrations; but this assistance should be confined to the early stages of growth.

Foresters have to consider this subject under several aspects: in the older woods, when pruning has been neglected, and when rotten cavities abound; in isolated trees of historical or ornamental character; and in newly planted areas.

In the first case, little can be done except to lead up by a gradual process to disforestment, with a view to replanting; or to adopt a drastic measure of immediate felling with the same view. In the second case, recourse may be had to "stopping" with cement or other substance, or to covering wounds to arrest decay. In the third case, skilful pruning and thinning should be employed with a view to growing the largest possible amount of high-class timber.

Many foresters, however, and men of high repute as such, object to artificial pruning; and this reminds me of an interview I once had with the most prominent of such men, now passed away. He was strenuously opposed to the pruning of oaks under any conditions whatever; and as he had planted more acres of oak than any other man of his day, his opinion was important, and younger men naturally hesitated to advance contrary views. Nevertheless, I have visited and carefully inspected oak woods of my old friend's planting, and I cannot help expressing my opinion that he erred in this respect, as I will illustrate by a description of what I observed.

These areas were planted between seventy and fifty years ago, there being evidence of continuous planting within this interval of years. Oaks were planted as the main crop and were "nursed" by Scotch pine. The initial distance between the oaks was about twelve feet, which gave 300 trees (more or less) to the acre. This number, on medium soil, may be carried to useful maturity, provided the nurses are removed in reasonable time; and for many years there will be room also for a large number of Scotch pines. In such a case the land may be said to be fully stocked; but thinning is usually commenced too early, and the process is too drastically carried out. When this has happened the mischief is done, and the future success of the planting as an area for timber production is impossible.

Again, it is the thinning carried to excess which destroys the principle (right, under certain conditions) of natural pruning. Had the original number of oaks been retained and some pines left, there would have been an unbroken leaf canopy. The ground would have retained moisture through the hindering of evaporation; light would have been modified; and the lower

branches would have died off when small, the wounds would have healed, and a clean bole, free from blemishes, would have resulted. It is probable that this was the method intended by the planter; but those who followed him in the management thought, or at least acted, differently, with the result that there are now less than 100 oaks to the acre, and no pines, except a few here and there, isolated or in small groups, which stand as examples of what might have been under wise management.

Here is exemplified the reverse of what a skilled forester would wish to see—blue sky overhead instead of a leaf canopy, large dead and dying limbs with a rotten cavity at the base of each, and a great display of epicormic branches, *i.e.* small branches growing from the stem or bole of the tree.

This is a state of things which cannot be remedied, for no forester, however high his attainments, can rectify the errors of his predecessors; he can but do his best under adverse circumstances. Unfortunately, owing to the uncertainty of life and of all things mundane, few foresters who plant can carry their planting through to maturity, neither can they secure their system from untoward interruption. This can only be effected by landowners who themselves possess forest instincts and who will impress such upon their sons.

It is not too much to say, neither is it too drastic a statement to make, that the woods of this country, with few exceptions, are a discredit to the owners. Let those who would deny this walk through the woods and make calculations as to the number of trees, and the cubic feet per acre, taking note also of the defects named through lack of pruning, or through errors in thinning, and they will perforce come to the same conclusion. If the value of the waste through decay and through failure to take advantage of ripe timber were calculated, the amount of lost capital would stagger any one interested in the subject.

With regard to long and straight trunks free from blemishes, an instance may be referred to in Buckinghamshire, in which there is, on a clay pocket of circumscribed area, a group of magnificent oaks growing in a beech wood. Such oaks are seldom seen, and their size and quality are due entirely to the friable and deep clay they are growing upon, and to the close proximity of the trees one to another. The trees, to the first limb, run to about 40 feet high, and the girth is very great indeed. Probably the trees will average from 100 to 150 cubic feet each. The chief and most marked feature, however, is the wonderful symmetry of each tree; and the small and compact leaf surface, sufficient yet not excessive, is a further feature of this interesting example. Here Nature has pruned, and so

successfully that not a blemish is visible. It is instances such as these which prove to the thinking forester what may be done, and what may result from continuous good management.

A few years ago the writer was requested to find, for important Government use, fifty large oaks. The contractor had some trouble in obtaining exactly what he wanted, and was

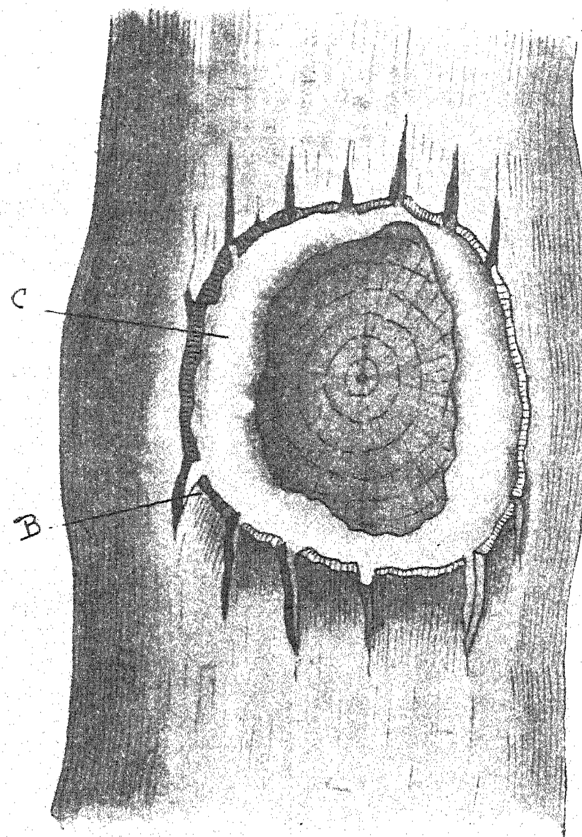


FIG. 1.—The cut surface of an oak branch, 3 inches in diameter, cut off with a sharp chisel in April 1898. C, the overspreading of the cambium and cortical tissues, which is rapidly covering the wounded surface, and which, owing to health and vigour, has been unusually active in its development. B, the dead cortex, cracking under the pressure caused by the growth of the stem. The cushion-like development of the cambium is due to the growth being more rapid where it is relieved from bark pressure.

fortunate in finding an owner of land willing to help him out of the difficulty. The trees required were of abnormal size, and freedom from blemishes was imperative; therefore the supply

could only be obtained from woods of old standing. The difficulty in procuring the required number of the specified size was very great; where size was attained there was almost invariably a flaw, or flaws, through decay caused by dead "horns," or what country people call the "water-limb." Some of these, all clearly traceable to the same cause, were large enough to hold a gallon of water.

Trees, young and old, suffer from numerous diseases, arising from insect and fungus attacks; whilst they are smitten by

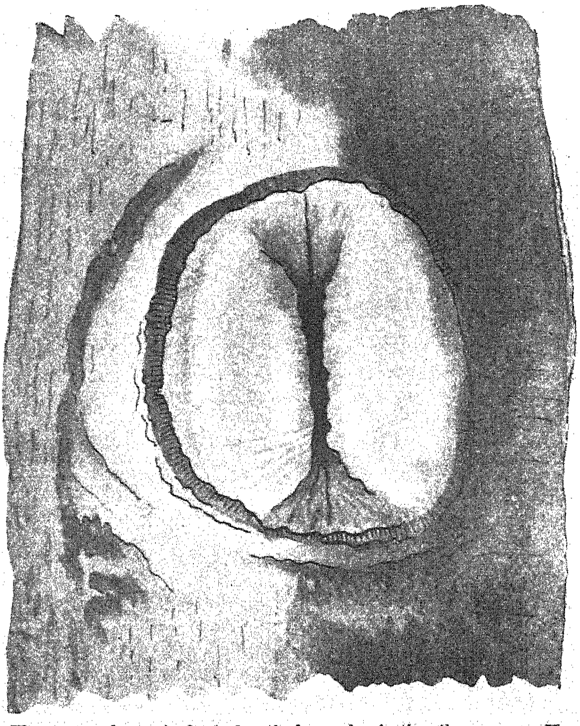


FIG. 2.—The same surface as in fig. 1 after the lapse of a further three years. Here the cut surface is practically covered, and in fig. 3 this is still more clearly illustrated.

premature decay through causes over which foresters have no control. Nevertheless, there seems no reason to doubt that the chief mischief to our timber supply is due to the want of pruning.

This source of loss unfortunately does not stand alone, as it is almost invariably accompanied by insufficient stocking; so that the supply is limited and defective. This is due chiefly to

the effort made in years gone by to grow coppice as well as timber. The oaks were cut out to encourage the stools of underwood, and the "heirs" were not protected as they should have been—that is, they were not sufficiently considered as the future timber of the estate. Now, with the coppice industry gone, and the oak supply reduced to a minimum, landowners find themselves in an unfortunate position. With a view to keep up as nearly as possible the revenue from timber the number of trees felled yearly exceeds what the woods can legitimately yield—there is a drain upon the capital. This can only last a short time; and many owners have already discovered that the process of destruction must be discontinued if a sylvan area is to be preserved at all.

It is only by entering upon a new system that the evils of the past can be remedied. New areas must be planted, and, when planted, treated with a view to growing a full crop of timber. Meanwhile, areas of established wood must be allowed to naturally regenerate, or must be artificially planted up.

The best way to illustrate a course of management of a young plantation, with a view to the increase of produce and the improvement of quality, will be to set forth in detail the method at present adopted in an oak plantation in the North of Ireland. No dogmatism is intended, and there is no wish to deal with matters positively, but simply to lay before those interested in forestry a system which shows signs of achieving the result desired.

The plantation is an extensive one, and is about thirty years old. The soil is a chocolate loam in which sand preponderates; it is moist, and well charged with organic matter. The site is on a river bank, and flat over the whole area. The original scheme was—oaks planted at twelve feet distances, perhaps a little more, as absolute regularity was not intended; nursed with larch, spruce, and silver firs, and Scotch and Austrian pines. The larch cankered from the beginning, as they were likely to do on such a site. They have been long ago completely cut out. The firs, other than larch, and the pines have grown remarkably well. The following measurements will convey an idea of their magnitude at the present time, given in order of size: Spruce fir, 8½ inches to 10½ inches quarter girth, four feet from the ground, height 50 feet. Silver fir, 6 inches to 8 inches quarter girth, and same height. Scotch pine, 4 inches to 5 inches quarter girth, and 45 feet in height. Oaks, 5 inches to 6 inches quarter girth, and height 45 feet. The oaks stand at the rate of 300 to the acre, and the nurses, still remaining, at 200, so that there are in all 500 trees to the acre.

The thinning process has been gradual; at no time has there been a drastic thinning, which is so often fatal to fruitful results. The object has been, as far as possible, to keep an unbroken leaf canopy. The firs and pines have been so spaced out as to occupy the central points between the oaks; and there is every indication of agreement, which is likely to continue to the mutual advantage of oaks and firs for a long period of years.

By and by, when the oaks require the whole ground, the firs will be of useful size, and may be removed; and the oaks

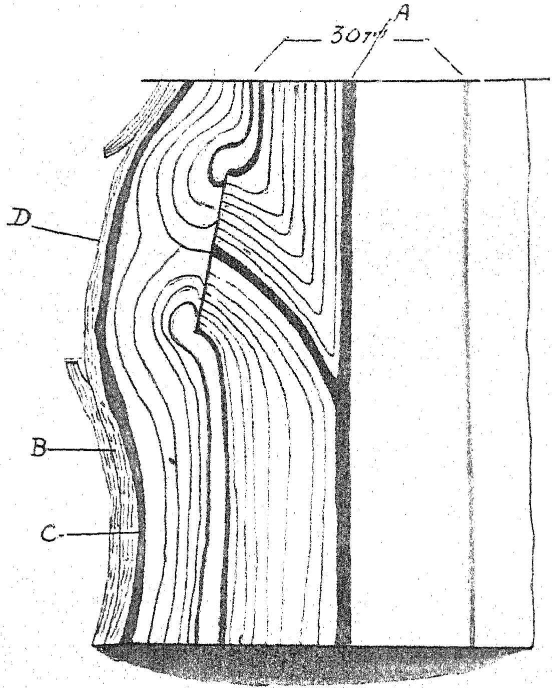


Fig. 3.—An imaginary longitudinal section, showing A, the pith, or original centre. B is the cortical layer, and the rough edges of the dead bark extending over the swelling caused by occlusion; D is the same, covering the whole surface of the wound. C is the cambium layer once more complete and continuous. It will be noticed, however, that the occlusion was practically complete four years after pruning. (No attempt has been made to denote by the zones of wood the exact age of the tree pruned. It was, in fact, about thirty years of age, as expressed by the number 30 at the top.)

may remain untouched to full maturity. So much for the thinning. With regard to pruning, the oaks have been twice pruned. Eighteen months ago each tree received attention in this respect; the branches, so far as a six-foot chisel would reach, were cut off close to the stem, leaving a clean stem of

nearly 12 feet in length. Later, as the canopy spreads, further pruning will follow, until a clean stem of over 20 feet is attained. After this Nature may be entrusted to do the rest. Every wound is healing rapidly, and it is probable that not a rotten hole will be found in the whole plantation. The illustrations (figs. 1 to 4) will show how rapidly the healing process follows the act of cutting. Another advantage gained by close contact is the freedom from epicormic branches, which are injurious to the timber and upward development. Those who have watched oaks, after a drastic thinning, will appreciate this as it deserves.

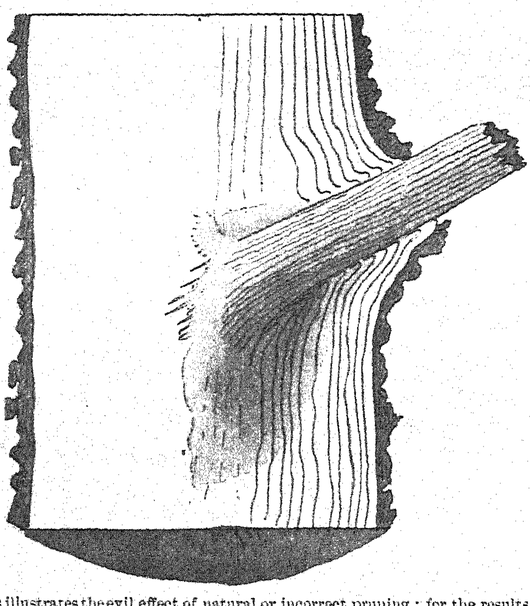


FIG. 4.—This illustrates the evil effect of natural or incorrect pruning; for the results are the same. The healing by occlusion is rendered impossible by the presence of the stump, which, as it dies, serves as a channel for the conveyance of water to the trunk. Decay, it will be seen, has already set in, and the planks, when sawn out, will be blemished, while in the case of fig. 3 the plank will be perfectly sound.

The oaks and nurses taken together, at the sizes named, will total up to 3,500 cubic feet per acre, and if twopence a cubic foot only is taken as a fair price as they stand this will amount to nearly 30*l.* per acre—a value not to be despised when it is borne in mind that the 2,000 nurses per acre already removed have well repaid the initial expenditure.

Further, as time passes, and the cubic contents increase, the

price per cubic foot will also advance, so that there is a twofold increment.

It is this progressive value that is often overlooked when valuing woodland areas. If this is borne in mind, and the system of management is sound, there are few better investments than that of judicious planting.

To meet the divergence of opinion upon the subject of pruning, some careful experiments have been made, and the progress of healing and general effects have been carefully watched over a series of years. The results in every case have been highly satisfactory, and these will be best shown by illustrations taken from the trees pruned. The trees were pruned between the months of November and March; the branches did not exceed $3\frac{1}{2}$ inches in diameter at the base, as branches 4 inches in diameter pruned previously were found to decay on the wounded surface before the healing was complete. The point of severance was as close as possible to the trunk; the cut was upward, and sharp, so as to leave a smooth surface. These points it is necessary to observe; for, if the branches are pruned off at a distance from the trunk, say, if only six inches, the effects already quoted, of decayed hollows, will surely follow.

In regard to thinning, experiments have also been conducted, and it has been found that an acre will carry a much greater number of trees to useful maturity than has been hitherto considered possible. Small thinnings now and then rather than a heavy thinning at one operation have been found most beneficial, and, in the case of Scotch pine, a full height—within reason—should be reached before they are thinned at all; for, if extensively thinned, the upward growth is hindered and the top is developed. In the case of oak the forester must keep the canopy, and this will be destroyed by injudicious thinning.

Timber merchants require length as well as girth, uniformity as well as quantity; and these requirements, with the coincident improved value, can only be secured by wise thinning and judicious pruning.

CHARLES E. CURTIS.

Brockenhurst, Hants.

LOUPING ILL AND THE GRASS TICK.

PROFESSOR WILLIAMS of the New Veterinary College, Edinburgh, published in the Highland and Agricultural Society's Transactions of 1897 a most valuable account of certain experiments made by him, which proved, almost beyond doubt, that Louping Ill[1] was conveyed to sheep by means of ticks. Four sheep were muzzled, and then turned out on infected ground at Leithen Hall farm. The only food they were allowed to eat was given them indoors. They were soon attacked by ticks, and, of the four, two died of louping ill. A fifth, a ewe, was kept at home at the College. Some ticks were placed on her, and ten days after she contracted the disease and died, without having been near the affected farm. These facts satisfied Professor Williams that the disease in these cases must be directly due to the attacks of the ticks. He also found that, of four sheep that he inoculated with cultivation material taken from the spinal canal of a sheep that died of louping ill, three contracted the disease and died.

In May of the same year Messrs. Meek and Greig-Smith published a paper stating that they had succeeded in cultivating a bacterium, taken from wounds caused by ticks on a sheep. Two rabbits, on being inoculated with this, exhibited all the symptoms of louping ill. One developed abscesses, a common feature of the disease, and the other died in two days.

The attention of those interested, in the districts where louping ill prevails, was thus specially called to the ticks, which locally had long been believed to be, in some unexplained manner, connected with the disease.

This view was strengthened by analogous cases reported from abroad, such as Texas fever, tick fever in Queensland, and redwater in the United States of America, concerning which searching investigations have been made by order of the Governments of those countries. The information so acquired, having been published locally, does not fall readily into the hands of English readers, and can only be obtained by a certain amount of trouble. A knowledge of what has been written concerning the life-history of the foreign ticks, and of the

[1] The chief symptoms of louping ill, or "trembling," are loss of muscular power, cramp, trembling, paroxysms, reeling, &c. For a full account of the disease see Dr. Klein's article in this Journal, 3rd series, vol. iv., 1893, pp. 625–636.

measures recommended to mitigate the damage done by their attacks, is invaluable to those who desire to investigate the question of louping ill, with which the foreign diseases have much in common.

It was found impossible to obtain any trustworthy information regarding the identity of species, or the life-history of any one of our British ticks. They have been almost totally ignored by British naturalists.

Professor Williams mentioned three species,—ricinus, erinaceus, and marginatus,—as having been found during one of his previous investigations,[1] and recognised by Mr. Moore of the Bethnal Green Museum, where the drawings of ticks made by the late Mr. Andrew Murray, referred to in his "Handbook of Economic Entomology," were at that time deposited. On writing, however, to Professor Williams, he informed me that "the classification of ticks was his stumbling block," and a reference to the South Kensington Museum, where Mr. Murray's drawings are at the present time, showed that they are quite unreliable, and useless for purposes of identification. Four of them apparently are intended to represent Ixodes reduvius, but appear under three different names. The descriptions are most meagre.

In the Highland and Agricultural Society's Transactions for 1884 an article appeared purporting to describe certain species of British ticks, but these descriptions are far too meagre to afford any information of value. Mr. Murray's nomenclature is professedly adopted, but it seems quite possible that the majority of these descriptions apply to grass ticks in various stages of development.

The public collection of insects at the British Museum contains no British ticks, but through the courtesy of one of the Curators, Mr. Pocock, a small private collection of British and other ticks was examined by me, but without any satisfactory results.

Dr. Cooper Curtice writing on the cattle tick of Texas says: "*To the scientist studying the tick to learn its life-history, habits, form, and anatomy, the fact that these animals are pests to the stockman throughout the greater part of the year is of very little importance, while the latter cares little about such matters if he can only learn how to rid his cattle of them. Yet it is only by learning the life-history that any remedies to prevent them can be applied intelligently, and the fact that the knowledge attained is of practical value adds a double interest to their study.*"

[1] *Highland and Agric. Soc. Trans.* vol. xv. 1883.

It was with this object in view that I applied myself to find out what species of tick was the carrier of the louping ill bacillus, and so much of its life-history as I was able, from personal observation.

Species.

For this purpose I obtained some scores of ticks from the hill sheep in the North Tyne Valley, where louping ill is prevalent. In every case they have proved to be of one and the same species, locally called the "grass tick," the scientific name of which is Ixodes reduvius (Leach), supplied me by the courtesy of Professor Neumann of Toulouse, and subsequently confirmed by Mr. Pocock. It is described by Walckenær and Gervais.[1]

These ticks were obtained in every stage of development, and there can be no possible doubt as to the identity of the species in each case, as I have preserved them in confinement through their metamorphoses.

The adult females are easily recognised, before they become distended, by their deep red bodies, dark brown legs, shield, &c. The males are of a uniform dark brown.

Grass ticks have no eyes. Before the adult stage the sexes are not distinguishable. The larvæ, pupæ, and females have part of the body (always less than one half) covered with a shield. When the tick is distended, the shield only covers a very small portion, as it does not increase in size as the body does. The males have the whole back covered with the shield, except a narrow margin. The larva has only six legs, and no spiracles for respiration, which all other stages have, together with eight legs. The orifice of the genital organ of the female is only present in the adult stage.

The following figures and description of the grass tick—Ixodes reduvius (Leach)—will probably suffice for its identification in all its stages of life:—

The Egg. Length 0·59 mm. by 0·42 mm. in width.[2] Oval, golden brown in colour, smooth and shining. It is covered with a glutinous secretion whereby the eggs adhere together in masses.

Larva (fig. 1). Length about 0·80 mm., to about 1·50 mm. when fully distended. Body transparent, with olive-green

[1] This tick, as well as the two species plumbeus (?) and hexagonus, mentioned subsequently, was described by me in the June, July, and September numbers of *Science Gossip*, 1899.

[2] 1 mm. = 0·03937 inch.

intestinal markings. As it distends it becomes opaque white, blue black, and finally quite black.

Pupa (fig. 2). Length about 1·60 mm. to about 2·30 when distended. Body olive white, more opaque, with four distinct brown posterior intestinal markings. Also similar anterior ones, leaving a paler centre to the shield shaped like an arrow-head. When distending, opaque white to blue black, and finally black.

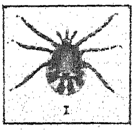


FIG. 1.—Larva.

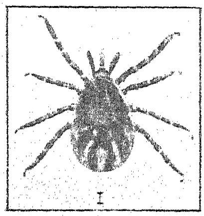


FIG. 2.—Pupa.

Adult male (fig. 3). Length about 2·35 to 2·80 mm. Basal joint of front pair of legs furnished with a spine. Body dark brown, almost black, with brownish-white margin. Mottled with obscure reddish marks, difficult to see even when magnified. Incapable of distension.

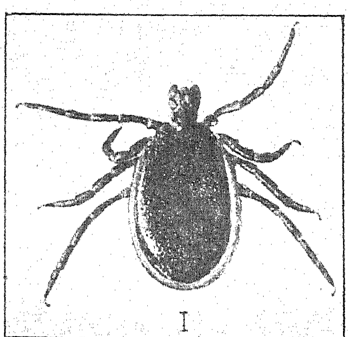


FIG. 3.—Adult male.

Adult female (fig. 4). Length 2·85 to 3·25 mm. when not distended, to about 10 mm. long by 6·40 mm. wide, and 5 mm. deep, when fully distended. Basal joint of front pair of legs with longer spine. Legs, shield, &c., dark brown to nearly black. Colour of body deep orange-red, and showing four dark longitudinal lines, lighter underneath. Light grey in front, both above and below. Pubescent, opaque, and margined. When distending, light red to reddish grey, or even pure white. Fully distended, olive green, or dark red to black, with irregular yellow streaks on the back and sides when about to lay eggs.

There was another tick (Ixodes plumbeus ?), very prevalent on the shepherds' collie dogs at the same time and in the same

locality. Its body was nearly white, with other parts of a light testaceous brown. In no instance was one found on a sheep.

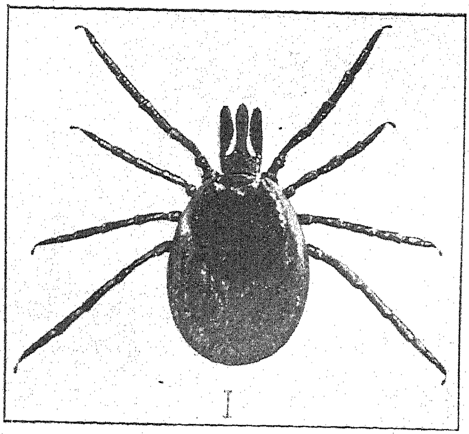


Fig. 4.—Adult female.

Life-history of the Grass Tick.

Sheep ticks (which must not be confused with the sheep-ked, or keb, a wingless six-legged fly, universal on sheep everywhere) are allied to the spiders. They pass through four stages of existence: the egg—the six-legged larva—the eight-legged pupa—and finally the eight-legged adult male or female.

In each of the three stages of larva, pupa, and adult female, all species of ticks attack some "host" or animal, either beast, bird, or reptile, to which they attach themselves by the "rostrum" or beak, and become greatly distended by suction of the host's blood. When replete, they fall to the ground—if a larva or pupa, in order to undergo its metamorphosis to the next stage of its existence, and afterwards seek a fresh host—if an adult female, to lay its eggs amongst herbage. The adult male is not capable of distension by suction, though it equally attaches itself to a host.

After undergoing metamorphoses, grass ticks, with the exception of males, are light in colour, soft and lethargic, and remain concealed for some time while recovering strength before seeking a fresh host.

Dr. Marx, in a most carefully considered article, draws special distinction between the "free living" tick, before attachment to a host, and the same as a parasite during attach-

ment. He does not, however, point out that this change of habit occurs three times during the life of each individual.

Professor Neumann alludes by inference to the fact that a fresh host is sought by ticks three several times during their existence, but he erroneously says that "larvæ do not attach themselves by the rostrum, and that they preserve their primary clear colour," whereas larvæ distend undoubtedly by suction, and become as dark and opaque as either pupæ or adult females under similar conditions.

The Larva.

When first hatched out from the eggs, which are supposed to be laid at the roots of coarse herbage, the young ticks are white and soft, but soon gain strength. Provided the weather is favourable, they climb up the stems, and, holding by their two posterior pairs of legs, await the passing of a host, employing their two front legs as insects use their antennæ.

In this, as in other "free living" stages of their existence, the young larvæ show great activity, attaching themselves and clinging tenaciously to any moving object. They may be taken easily in a sweep net off the herbage, and especially off rushes. They appear to be more numerous on the rank rushes growing in damp undrained places. I took some dozens together with pupæ in May, and again in August, September, and October of this year in Alnwick Deer Park. Pupæ were found as early as April 21, but the first larvæ I found were on May 17.

On finding a host, larvæ attach themselves by the rostrum, and remain there for about two days,[1] by which time they are distended, black and globular. At this time they are easily detached from the host, and have lost their activity and clinging habits. I removed many from sheep in this condition on May 26 of this year.

I carefully preserved some fully distended larvæ of an allied species (Ixodes hexagonus), taken from a stoat, which were sent to me by Mr. Pocock on February 7 of this year, and kept them in a bottle in the usual way. They became hard, dry, chitinous, and nearly torpid. On April 29, after about 11 weeks, I found they had changed into pupæ. They had increased very little in total length, from 1·56 to 1·76 mm., but had, as pupæ, resumed all their active, "free living" habits. Though so little developed in total length, great changes had taken place. The

[1] The length of time occupied by grass ticks undergoing distension in their several stages may possibly vary owing to climatic or other conditions Further investigation is needed on this point.

legs, shield, and rostrum were much increased in length and size, and a fourth pair of legs and a pair of spiracles had made their appearance.

The Pupa.

The possession of eight legs distinguishes the pupa easily from the larva. The extra pair are placed ~~behind the~~ others. After the metamorphosis, the pupa takes up its position on the stalks of herbage, just as the larva had done, for another chance of attachment to a host. But whereas adult grass ticks seem to confine themselves mostly to sheep, cattle, and deer, the larvæ and pupæ attach themselves very readily to various hosts such as horses, dogs, and even human beings. After about four days the pupa is again replete with blood, black and opaque, and again drops to the ground to undergo its second and final change. As larvæ and pupæ, the grass ticks mainly attach themselves to the faces of the sheep, and as such are locally known as "face ticks," and were supposed to be of a different species on account of their small size. They proved, however, on subsequent development during captivity, to be all of the same species.

About a dozen distended pupæ of grass ticks, taken from sheep on May 29, though kept carefully moist, had the same dry, chitinous appearance as the larvæ above mentioned, and underwent metamorphosis about July 19, or also about eleven weeks after removal from the host. For some time previously they appeared to be dead, no motion of the legs, which were stretched out, being perceptible.

Adults.

About half of these proved to be males, and these were somewhat globose and black, with obscure brown markings, legs pale brown. The females at first were soft and transparent, the body yellowish blue with a black shield, legs and rostrum white. After about ten days both sexes attained their proper colours and strength. Until they had done so they remained very quiescent.

On reaching the adult age, both males and females again wait on herbage for a passing host. At this time, as well as after distension of the female on the host, an action which appears to be sexual intercourse freely takes place, even in confinement. The manner of it is remarkable. The rostrum and other mouth organs of the male are inserted in the orifice of the sexual organ of the female, which is situated between the bases of the posterior pair of legs.

Dr. Marx states, when writing of foreign ticks, that the organ of the male is similarly situated, and Dr. Cooper Curtice not only says that the two sexes bring "their external genitals" into contact, but further discusses the alternative probabilities of insertion or contact. As regards the grass tick, however, the action alluded to, which I have repeatedly watched under the microscope, is carried out as stated above. It has been also observed by Mr. Lewis, and Mr. Pocock, to whom I sent specimens for the purpose, and I understand the former gentleman proposes shortly to publish the result of his observations. The absence of this genital orifice in the pupa constitutes, with the exception of size, the chief difference between it and the mature female.

On the host the females gradually distend (fig. 5), and, in the course of so doing, vary much in colour and appearance. So much is this the case, that it is difficult to believe that they are of the same species. In fact, the attempt to determine the species of Ixodes from distended females has doubtless led to much of the confusion that exists in their nomenclature. In the case of flat, undistended specimens, there are generally prominent intestinal markings which might be helpful in distinguishing species. These are clearly shown in figs. 1 and 2 (p. 629). They are fairly constant during life, but are lost immediately after death, whereby the appearance of the tick is totally altered.

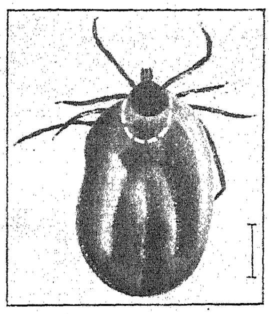


FIG. 5.—Partially distended female.

When fully replete, the female Ixodes reduvius becomes globular and black. One taken in this condition on April 15 commenced to lay on May 12, and a few others taken at the same time commenced shortly afterwards. Previous to laying, certain yellow irregular streaks appear on the back and sides, and another anal patch always appears on the underside, which increases in size as the eggs are deposited.

The Eggs.

The eggs of a female that commenced to lay about May 25 hatched out on July 19, after eight weeks, having been kept in a fairly constant temperature of about 65°. Those mentioned

by Messrs. Meek and Smith took twenty-two weeks, viz. from May 4 to October 12.

The number of eggs laid is very great, no less than about 2,050 having been roughly counted by me from one female of Ixodes reduvius. Mr. Barber mentions 20,000 as having been laid by a species of foreign tick.

Oviposition.

The process of laying the eggs is most remarkable. The head, which in the more youthful stages is held horizontally, is in the distended female held more or less at right angles to the body.

When egg-laying is about to take place, the head is further depressed till it rests close against the under side of the body. In this attitude the end of the rostrum actually touches the genital orifice, the palpi being at the same time widely opened out. Behind the head, and from beneath the shield at what for the purposes of explanation may be described as the back of the neck, a white, perfectly transparent, delicate gelatinous membrane is brought down through inflation either with air, or with a transparent fluid, above the head, which it temporarily conceals. The end of this membrane terminates in two conical points, or "fingers," which appear to be covered with a glutinous secretion, and at the same time an ovipositor of a somewhat similar character, but only semi-transparent, is pushed forward from the genital orifice. This latter is a tube, within which is the egg. As the ovipositor projects, it turns itself inside out, like the finger of a glove, leaving the egg protruded at the end, and lying between the two finger-like points of the membrane. The membrane and the ovipositor are then withdrawn each from the other. The egg adheres to the former (owing to its glutinous surface), which collapses through the withdrawal of its contents, dragging the egg forward and depositing it on the top of the head. This membrane, in its action, closely resembles the toy dolls of thin indiarubber which are blown up and collapse when the air pressure is removed. Neither the legs, the palpi, nor the organs of the mouth take any part in the oviposition, but arter the collapse of the membrane the palpi are closed, and the head is raised, by which action the egg is pushed forward to the front edge of the shield, forming, in time, an adherent mass of eggs which are deposited in front of the tick.

The time occupied in depositing one egg was three minutes, that between the laying of two eggs about six minutes. Mr. R. T. Lewis contributed an excellent and illustrated description of oviposition by a foreign tick in 1892. There are

some minor points of difference, attributable to the difference of species.

Powers of Fasting.

There seems no doubt that grass ticks never remain on the host to undergo metamorphosis, or to lay eggs. Their complete change of habit from active clinging parasites to a state of unwieldy and almost torpid helplessness, dropping to the ground as the natural means of seeking safety, renders it most improbable.

They must therefore either take their chance of finding a fresh host no less than three several times during their existence, or they must be capable of living and developing on a vegetable diet. I am aware that it has been held by Mr. Barber, Mr. Meek, and others, that the latter is the case, but I have seen no facts put forward in support of the supposition, and I have by degrees, and not without some hesitation, arrived at an opposite conclusion.

If I am correct, it is obvious that, unless suitable hosts are numerous, large numbers of ticks must perish before arriving at maturity; but Nature seems to have made provision for the uncertainty that must necessarily attend the endeavours of each individual to find hosts, the blood of which alone, as I contend, enables it to advance another stage towards maturity and the perpetuation of its species.

Not only does the female lay at least two thousand eggs, to replace the waste that must ensue, but in every stage the flat or undistended "free living" ticks are endowed with extraordinary powers of existing without food, provided only they are constantly supplied with a small amount of moisture, without which they quickly perish.

Larvæ of dog ticks (Ixodes plumbeus?) which I hatched out on October 9, 1898, from eggs laid on the previous August 4, lived till the beginning of August of this year, a period of ten months, and even then it is doubtful whether they did not die from being too dry. They were kept in a bottle with a sprig of moss and some damp sand. The moss was removed in April, and replaced by a small sheet of blotting-paper, from which it seems impossible that they could have obtained any sustenance other than moisture, yet they continued to live for four months longer. They made, however, no perceptible growth during that time. Owing to accidental circumstances, I have hitherto only kept larvæ of Ixodes reduvius alive for four months, but there is every reason to believe that they could survive as long as those of plumbeus under similar conditions.

Pupæ and adults can also survive for months. I have in my possession a few pupæ which I have kept for six months, and adult males and females for four months, and have no reason to doubt that they will survive much longer.

That no nutriment is necessary has been curiously confirmed by the fact that a young mature female, after undergoing metamorphosis from the pupal state in a bottle on July 19, proved to be deformed to the extent of the total absence of a head, and consequently of all the mouth organs.

Fig. 6 illustrates the underside of an ordinary female grass tick, and fig. 7 the deformed female in question. It shows clearly the total absence of all organs by which feeding could be effected. How such a malformed tick can exist at all seems

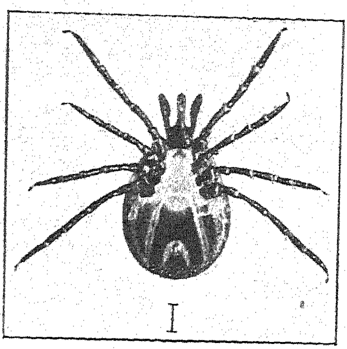


Fig. 6.—Female, underside.

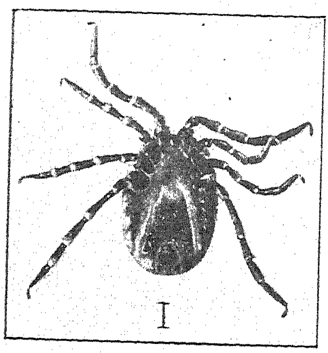


Fig. 7.—Headless female.

extraordinary, yet it is still alive and active, having already survived four months in this state.

Without moisture ticks soon die. Placed in a dry empty bottle neither larvæ, pupæ, nor adults survived more than two or three days. On the other hand, females exposed to about seven degrees of frost for a night seemed but little affected.

I have also noticed that whereas evacuations are passed by ticks on, and shortly after, removal from the host, as well as immediately after metamorphosis, no such are ever to be observed during the long periods of fasting above mentioned, nor after capture in a "free state."

Taking therefore into consideration

The power of fasting for many months,
Absence of evacuations at such times, and
The absence of all growth or development,

I consider it more than probable that ticks fast entirely in a free-living state, and only feed as parasites on a host.

Effects of Temperature on Length of Life.

There can be no doubt that conditions of climate and temperature have a great influence on the periods occupied by the ticks in the different stages of their existence. When cold they become torpid, and remain for lengthened periods without moving, but if placed in the warm rays of the sun they almost at once become active.

It seems probable that in fine warm seasons, with good fortune in soon attaching itself to a host, a grass tick may pass through at least two stages of its life in one year, but that, in cold weather and delay in finding a host, one stage may occupy a whole season. The term of its whole existence may therefore vary from $1\frac{1}{2}$ to 3 years.

Probably by far the greater number of ticks live from $1\frac{1}{2}$ to 2 years, but it seems possible, under the most favourable conditions, that all stages can be passed through in one season.

Allowing only $1\frac{1}{2}$ week for a tick in its larval and pupal stages to recover strength after metamorphosis and to find a fresh host, half a week on the host, and 11 weeks of repletion for development previous to the next change, the time occupied would be as follows:

Larva	13 weeks	($1\frac{1}{2}$ free, $\frac{1}{2}$ on host, 11 replete).
Pupa	13 ,,	(,, ,, ,,).
Adult female . . .	$7\frac{1}{2}$,,	(,, 2 ,, 4 ,,).
	$33\frac{1}{2}$ weeks = March 1 to October 18.	

Ticks make their first appearance on the sheep about March 1, and they have probably disappeared everywhere by the end of October. The period is therefore too short for any large number of ticks to complete their life and lay eggs for the following season.

On the other hand ticks should have no difficulty in surviving, provided they can secure at least one host during the season. The larvæ referred to above fasted 40 weeks, a longer period than a whole season, and, adding 11 weeks preparing for its change, practically the whole year round is accounted for. I have no reason to doubt that either pupæ or adults could survive a similar length of time without food.

Nature and Causes of Susceptibility to Attack.

Although, in addition to sheep, the grass tick commonly attacks cattle, deer, horses, and occasionally men and dogs, only sheep and cattle are known to incur louping ill from the effect of its attack. The experiments made with muzzled sheep by Professor Williams show that the bites of ticks are largely responsible for the spread of the disease by inoculation of the bacillus by the rostrum, but it must not be supposed that this is necessarily the only method of its propagation. I am informed that pigs are not attacked by ticks, but they have been known to die of louping ill after eating the *uncooked* flesh of sheep that had died of that disease. A dog also has been known to succumb under similar circumstances. When the flesh has been cooked no bad results have been known to follow. In these cases the bacillus must have been introduced by the mouth into the stomach, and undoubtedly many ticks are eaten by sheep and cattle, which may thus acquire the disease.

It has been commonly supposed that the poverty of the sheep at the time of lambing, after the shortness of keep and inclemency of a northern winter, renders them specially susceptible to the attacks of ticks in the spring season, and colour was given to the idea owing to the immunity of sheep on the better pastures of low land. This opinion was shared by me, until I learned from Mr. Dagg, the tenant of Gowan Burn Farm, in the North Tyne district, from whom much valuable information was obtained, that his best conditioned ewes and tups suffered at least as much as those in a poorer condition. This view is confirmed by the analogous case of the cattle disease of Jamaica, concerning which Professor Williams states that, through being in good condition, cattle only become immune from attack to a very limited extent.

Subsequent observations made in Alnwick Deer-park led me to a similar conclusion. The deer-park consists of pasture, woodland, and moorland, with bracken, heather, and rushes. It is divided from the rest of the park merely by a wire fence, the whole being surrounded by a high wall. Part of this park is used as a home farm, but I was informed by the shepherd that he had hitherto never seen a tick on a sheep. None had, however, been turned into the portion reserved for the deer for very many years. As an experiment twenty large Cheviot wethers in excellent condition were turned in on May 1. On the 26th grass ticks of all stages were found upon them, though the sheep had improved in condition. From this it was evident that the good condition of the wethers had failed to secure them

from attack by the ticks, and the causes of immunity of sheep on cultivated pasture lands must be sought for in other directions. None of the sheep turned into the deer-park at that time or subsequently have had any signs of louping ill. Grass ticks certainly abound in places where louping ill is unknown.

When these wethers were washed in June, they proved to be nearly clear of ticks, and none could be found on the herbage in July, but they reappeared early in August, and were numerous on the sheep in August, September, and October. There were therefore two distinct attacks, spring and autumn, whereas on the more exposed hill farms of the Tyne district there is only one annual attack in the spring. This generally commences about March 1, on which day of this year two adult females were found on sheep at Gowan Burn, and the attack was practically over on June 1, though a few isolated specimens may be found in the autumn, but louping ill is not common at that season. Messrs Meek and Smith state that a double attack takes place almost annually in Skye, where the climate is mild, and I found grass ticks in abundance in Invernessshire in August.

Three material questions therefore arise :—

1. Why are certain districts, farms, and even individual fields infested by ticks, and subject to louping ill, whereas others, perhaps adjoining, are free?

2. Why should some places be subject to two annual attacks, whilst others have but one?

3. Whence do the ticks obtain the louping ill bacillus?

As to the first question, I have only found ticks where coarse herbage abounds, and this may be accounted for by their inability to withstand drought. As above mentioned, whereas young ticks kept moist lived ten months from October to August, others placed in a dry bottle on August 7 survived only three days.[1] So long as there is good harbourage at the roots of rushes and rank herbage, moisture is sure to be present, and the ticks can endure many months waiting for a host; but where the grass is cropped short, and the sun and wind can penetrate and dry up the surface moisture, the ticks would die.

This view is indirectly confirmed by Professor Williams's advice, which has also often been given elsewhere—"Improve your pasture, and louping ill will cease." Excellent advice!

[1] Mr. Meek states that "larvæ can resist extremely dry conditions." It is evident however from the context, that there is a clerical error, and that eggs, not larvæ, are referred to.

but totally inapplicable to hill farms containing thousands of acres of poor wild land. Killing old grasses over large areas, and sending sheep to pasture on clean land during the tick season, as also recommended by him, are almost equally impossible to a hill farmer, and the latter proposal might, under certain conditions, be attended with some danger of introducing the disease on to the clean land. Practical remedies must be sought for in other directions for such districts.

With regard to the second question, it is probable, as suggested by Mr. Meek, that it is a mere question of climate, and the consequent varying period of time occupied by the ticks in undergoing their metamorphoses. The affected districts of the Tyne Valley are fairly high, being from 600 to 1400 feet above sea level, and they are cold, wet, and windswept. There is much difference between them and the Alnwick Deer-park, where the altitude is from 100 to 600 feet, and comparatively sheltered. It may well be that on the hills the time both for incubation and metamorphoses would be so much extended that the majority of the ticks would not succeed in passing through more than one stage of existence in the season.

In the warmer climate development would be more rapid, with the result that the ticks would be ready for a second attack in autumn. Dr. Cooper Curtice's experiments show that the development of ticks is so rapid, in hot climates, that the whole time consumed between the laying of eggs by a Texas cattle tick to their arrival at the adult stage was only $2\frac{1}{2}$ months.

The third question, "Whence do ticks obtain the bacillus?" is one of much importance. It has generally been thought that the bacillus has been acquired by the ticks from the ground, or from herbage on which they were supposed to feed. I have given reasons for my contention that they feed only on the blood of the host, in which case it is improbable that the bacillus can be acquired in the manner supposed.

In this matter we may receive valuable assistance from analogous instances in the colonies. In his investigation of the tick fever of Queensland, Dr. Hunt found that the disease could *only* be communicated by ticks taken from cattle *where disease was prevalent*, and Mr. Fuller states that the "redwater" of the United States of America was found to be carried from beast to beast by the ticks, and moreover that the power of producing the disease was communicated from the maternal tick through its eggs to its offspring.

Danger of Introducing Louping Ill on Clean Ground.

No explanation has ever been given, so far as I am aware, to elucidate the apparent paradox that while sheep taken from foul ground are known to introduce louping ill on clean hill land, yet the cultivated lowlands, to which thousands of hill sheep are drafted every autumn to be fed off, are never infested.

These sheep, which are drafted in September and October, would, at that time, be infested with ticks if taken from localities where autumn attacks occur.

Nothing is yet known of the life-history of the louping ill bacillus, but, judging from the above-mentioned investigations made in connection with tick fever and redwater, it is probable that it must pass alternately through the body of the host and that of the tick as carrier from one host to another.

If this be so, the bacillus must die out, so soon as the ticks from these sheep perish of drought on the short pastures or arable lands of the lowland cultivated districts, and the immunity of these areas from disease would thus be accounted for.

The improbability of the microbe remaining dormant in the sheep during the winter in a condition to cause an outbreak in the following spring, without the fresh intervention of the tick, is demonstrated by the fact that with the drafted sheep no such outbreak occurs, and the death of the ticks renders a fresh inoculation impossible.

The effect of removing sheep from infected to clean hill land would be totally different. Not only would any ticks removed with the sheep find ample harbourage and multiply, but such hill land would probably be already infested with harmless ticks (as is the case with Alnwick Deer-park), and would only require the introduction of some sheep or ticks containing the bacillus to establish louping ill on the ground *in perpetuity*.

It will therefore always be dangerous to remove sheep from infected farms to clean land where ticks are to be found, or where long rank vegetation grows in any quantity.

The well-known fact that fresh clean sheep introduced on infected farms are specially susceptible to the disease cannot be explained, but again it is thoroughly in accord with the well-known conditions of similar diseases.

Possible Remedies.

Dipping does little or no good. The dips in use only kill those ticks that are on the sheep at the time of application, and after the bacillus has already been communicated. I am not aware of any innocuous dip that will prevent further attacks by

ticks, immunity from which would alone be efficient in checking the disease.

Experiments were made this year, based on a suggestion ot Mr. Barber's, of giving sheep sulphur, which was mixed with crushed oats. This was readily eaten, and no bad results to the sheep followed, but the suggestion of Mr. Barber that the exudation, through the skin, of sulphides formed in the stomach would keep off the ticks, proved a total failure. As, however, none of these sheep chanced to take louping ill, the experiment will be repeated in case the sulphur may tend to render the sheep immune. "Bricks" made of sulphur and salt by Messrs. McDougall & Co. were tried, under the supervision of Professor Somerville, but proved a failure, being unpalatable. The firm have now improved on them, and have made a brick that is taken by all stock very readily. It is proposed to try the sulphur in this form next year, both as being convenient, and also in case good results may accrue from the salt, since Professor Williams says, "cattle in Jamaica are freer from disease when drinking brackish water."

Mr. Pound, director of the Queensland Stock Institute, contributes a paper relating to the successful inoculation of cattle as a preventive of tick fever. The details of the procedure are too lengthy for repetition here, but so successful are the results stated to be, that Mr. Pound concludes by saying, "By following this mode of procedure stockowners have the satisfaction of knowing that the possibility of their cattle not being immune to a subsequent attack of fever is reduced to a minimum."

If it should prove to be the case that grass ticks can only obtain the louping ill bacillus from diseased hosts, it is obvious that the clearance of the land of sheep and cattle until the existing generation of ticks, together with their immediate offspring, have died out, would probably clean the land once for all. This would be an expensive cure, but the disease might probably be greatly reduced, if not altogether exterminated, if a few acres of ground were fenced off on each hirsel,[1] as a quarantine or sick field, to which all sheep should be *at once* removed on showing any symptoms of louping ill.

It would be essential that the pasturage of this ground should be kept as short as possible, and all rank vegetation, bracken, rushes, &c., kept down. Damp places should be carefully drained. Sick sheep removed to it should be examined, all the ticks on them hand-picked and destroyed,

---

[1] Every hill farm is divided into "hirsels," each having its separate flock in charge of its own shepherd.

and the sheep confined in the field during the remainder of the tick season.[1] The enclosure should if possible be dressed with salt, gas lime, or other dressing that would improve the herbage, and tend to destroy the ticks.

By this means, provided sheep were promptly removed from the hill before the ticks began to drop off them, all ticks containing the bacillus would gradually be localised in one place, where they would be destroyed by the summer droughts owing to the absence of harbourage in rank vegetation.

A far better and more certain method would be to stamp out the disease by at once killing all affected sheep and burying them where they lie.

It must also be remembered that ticks very soon leave the body of a dead host, and drop into the surrounding grass. Dead sheep should therefore at once be buried. If skinned, the skin should be carried away in a bag, to prevent the infected ticks dropping from it on the moor, and the grass around where the body lay burned to destroy any ticks that may have already left it.

If the farm can *once* be cleared of the disease, there is every reason to believe that it cannot again be introduced except by bringing sheep on it from infected areas. Some extra trouble is therefore well worth taking for two or three years, to secure permanent immunity.

It is hoped that this paper may be of use, not as suggesting any remedy that has been proved to cure or prevent the disease—that stage has not yet been reached—but rather as supplying such information relating to the habits of the grass ticks as may give reasonable explanations of certain hitherto obscure points in their life-history, and may prevent useless and possibly disappointing experiments being taken on mistaken premisses.

It is also hoped that the few remedies that have been indicated are worthy of practical trial, even if they result in failure. They are at least in accordance with knowledge that has been acquired of other and analogous diseases, and they may therefore be tested with a reasonable prospect of success.

Conclusions.

One species only of tick, Ixodes reduvius, commonly known as the grass tick, has been found to carry the louping ill

[1] Since the length of time the bacillus can remain in the sheep is unknown, it would doubtless be safer to dispose of the infected sheep, instead of returning them to the hill.

bacillus to the sheep. It is easily recognised by the red body of the young females, the legs, shield, &c. being dark brown.

It lays its eggs, and undergoes its metamorphoses, in coarse herbage, and after each change seeks a fresh "host" on which to distend itself to a large size by suction of blood.

In all stages grass ticks abstain from all food except when on a host, and they are endowed with extraordinary powers of fasting until a host is found.

Ticks soon die of drought where there is no good harbourage among rank vegetation.

Judging from analogy, it is probable—

That the bacillus can only be obtained from a diseased sheep, and inserted by the tick into another sheep.

That ticks convey the bacillus through their eggs to their offspring, as well as retain it through their metamorphoses.

That there is no danger in removing sheep from foul ground to cultivated lowlands, but that the disease is easily imported from one hill farm to another.

Strong and fat animals are nearly as susceptible to attack as weakly ones.

If the land is once free of disease, it can only be re-imported by diseased sheep, or ticks taken from them.

Suggested Measures for Prevention.

Burning and cutting of long grasses, bracken, rushes, &c.

Salt and sulphur given to the sheep.

Inoculation.

Removal of all diseased sheep to a separate inclosure, where hand-picking and dipping are carefully attended to, the pasture is kept short, and damp places are drained. The sheep to be confined to this inclosure so long as the tick season lasts.

Immediate slaughter and burial of all affected sheep.

Authorities quoted: C. A. Barber, *Nature*, June 1895, p. 198. Dr. Cooper Curtice, *Agricultural Gazette New South Wales*, July 1896. C. Fuller, *The Common Blue Tick of Cape Colony*, 1899. Dr. Hunt, *Annual Report Department of Agriculture*, 1897-8, Brisbane. Dr. E. Klein, *Journal of the Royal Agricultural Society of England*, 3rd series, vol. iv., 1893. R. T. Lewis, *Trans. Royal Microscopical Soc.*, May 18, 1892. Dr. Marx, *Morphology of Ticks*, Washington Ent. Soc. Trans., 1892. Meek and Greig-Smith, *The Veterinarian*, May 1897. Murray, *Handbook of Economic Entomology—Aptera*. Professor Neumann, *Treatise on the Parasites and Parasitic Diseases of Domesticated Animals*. J. C. Pound, *Queensland Agricultural Journal*, May 1898, January 1899. Walckenær and Gervais, *Histoire Naturelle des Insectes, Aptera*, vol. iii. p. 137 (1844). Professor Williams, *Veterinary Journal*, November 1896. *Highland Soc. Trans.* vol. ix. 1897, vol. xv. 1883.

E. G. Wheler.

Alnwick.

Official Reports.

REPORT OF THE COUNCIL

TO THE

HALF YEARLY GENERAL MEETING OF GOVERNORS AND MEMBERS OF THE SOCIETY,

HELD AT THE SOCIETY'S HOUSE,

13 *Hanover Square, W.*,

ON THURSDAY, DECEMBER 7, 1899.

The EARL OF COVENTRY (Vice-President) in the Chair.

THE Council have to report that the list of Governors and Members has undergone the following changes during the half-year which has elapsed since the Anniversary General Meeting in May last:—167 new Members have joined the Society, and 10 have been reinstated as Members under Bye-law 12, whilst the deaths of 1 Foundation Life Governor, 1 Honorary Member, 35 Life Members, and 46 Annual Members have been reported. A total of 16 Members have been struck off the books under Bye-law 10, owing to absence of addresses; 27 under Bye-law 11, for arrears of subscription; and 76 have resigned.

2. Amongst other Governors and Members whose loss by death the Society has had to deplore since the last General Meeting are: Mons. Henry De Vilmorin, of Paris (one of the Honorary Members); Lord Farrer; Sir C. F. Farran (Chief Justice of Bombay); Sir John H. Fowler, Bart., Sir William Hayward, Colonel Sir Edward Hulse, Bart. (a Foundation Life Governor), Sir C. Lennox Peel, K.C.B., Sir Thomas Story, Mr. W. Talbot Crosbie, of Ardfert Abbey, Tralee, and Mr. Montagu Tharp, of Chippenham, Newmarket.

3. These and other changes bring the total number of Governors and Members now on the Register to 10,846, divided as follows :—

9 Foundation Life Governors (Members elected before the granting of the Charter on March 26, 1840) ;
73 Governors paying an annual subscription of 5*l.* ;
106 Life Governors ;
6,983 Members paying an annual subscription of 1*l.* ;
3,535 Life Members ;
116 Life Members by Examination ;
24 Honorary Members ;

10,846 Total number of Governors and Members,
as against a total of 11,034 Members at the same period last year.

4. To fill the vacancy caused by the transference of Sir Jacob Wilson to the list of Vice-Presidents, Lord Middleton, of Birdsall House, York, has been elected to a seat on the Council.

5. The Society's Sixtieth Annual Country Meeting was held in June at Mote Park, Maidstone, on a site generally admitted to be one of the most beautiful in the South of England. Although the Local Committee had experienced great difficulties, involving a very heavy expenditure, in providing a supply of water to the Showyard, they carried out their engagements in a thorough and liberal manner, with the result that the Society had one of the most compact and convenient Showyards it has ever occupied. Owing probably to the situation of Maidstone and the absence of large towns in its vicinity, the attendance fell below even the most moderate estimate, in fact, lower than in any of the past twenty-five years, although adequate preparations had been made by the railway companies, who did their best to attract the public to the Meeting.

6. Taking advantage of the nearness of Maidstone to the Continent, a large number of foreign agriculturists visited the Show, including two official Deputations from the National Agricultural Societies of France and Germany. In commemoration of this visit, the Council offered the Honorary Membership of the Society to the heads of the two Deputations—the Marquis de Vogüé, President of the Société des Agriculteurs de France, and Herr Berndt von Arnim, Chairman of the Directorate of the Deutsche Landwirtschaft Gesellschaft. The badges of Honorary Membership were personally handed to these two distinguished foreign Agriculturists by H.R.H. the Prince of Wales at the General Meeting held in the Maidstone Showyard, and the Council have reason to know that this international compliment has been greatly appreciated both by the recipients and by the Societies they represent.

7. The Council regret to have to report that the financial result of the Maidstone Meeting, as certified by the Society's Auditors, was the very considerable loss of 6,382*l.* 1*s.* 11*d.* The chief item of ex-

penditure connected with the Society's Shows as at present organised is the erection of the sheds and buildings, and the preparation of the site for the purposes of a showyard. This cost the Society at Maidstone 8,182*l.* There is, as the Members will understand, a very large indispensable expenditure which has annually to be incurred by the Society under this head, whether the show be large or small; but, of course, the cost of the building of the Maidstone showyard was less than that of the two large shows in 1897 and 1898 at Manchester and Birmingham. Timber is now dearer than it used to be, and the price of labour is going up. Moreover, the Society is now under the necessity of laying water-pipes throughout the showyard, which was formerly undertaken and paid for by the Local Committee.

8. The Society has to employ a skilled clerical staff at Hanover Square throughout the year to conduct the correspondence relating to the Show, to deal with the entries, prepare the catalogue, and transact other business connected with the show; and this staff has to be largely augmented at the time of the show by stewards, assistant-stewards, money-takers, ticket-sellers, foremen, grooms, yardmen, door and gate keepers, dairy assistants, veterinary surgeons, engineers, and police. The total expense for staff and administration was this year 4,327*l.* The Society disbursed 4,791*l.* in prizes, 674*l.* for forage for the animals, 961*l.* for the expenses of the judges, 1,175*l.* for printing (including catalogues), 709*l.* for advertisements, and 313*l.* for miscellaneous expenses. These figures do not include the expenditure of the Maidstone Local Committee, amounting to no less than 8,200*l.*, in providing and preparing the site, supply of water, local prizes, expenses, and the like.

9. The Society, having once pledged itself to the holding of the Show, had practically to expend, or make itself responsible for, the whole of the items above referred to, amounting in all to 21,132*l.*, before it opened the doors of the Show to the public. It received towards this expenditure, 2,000*l.* from the Local Committee, 4,506*l.* for fees from the implement exhibitors, 1,648*l.* from entries of live stock, 240*l.* from other entries, and 216*l.* from various sources. These items only amounted to 8,610*l.*, and for the balance (12,522*l.*) of its total expenditure the Society had nothing but the admissions of the paying public to look to. Only 68,576 persons, however, passed the gates (the lowest since 1875), and as these visitors only paid—including purchases of catalogues—6,140*l.*, there was a debit balance of 6,382*l.*, which has had to be made good out of the Society's general funds. As the average takings of the previous six years had been 12,100*l.*, this result is naturally a very serious disappointment both to the Council and to the Maidstone Local Committee.

10. It is obvious that Maidstone was hardly the place at which the Society, had it been actuated only by monetary considerations,

would have pitched its showyard during the present year. But it was in accordance with the present scheme of rotation of districts that there should be a show this year in the South of England; and as the Society had not visited Kent for thirty-nine years, that county had a special claim upon its consideration. The Society received a very cordial welcome from Kent and its capital town, and everything possible was done by the local authorities to make the Meeting a success—which, indeed, in every respect but the financial, it undoubtedly was.

11. At the same time, the Council recognise that now that the present rotation is drawing to a close, there may be great advantage in a strong Committee considering carefully and deliberately what modifications or alterations in the existing show system may be desirable in the future, with the view of minimising, as far as possible, the financial risks to the Society incurred by the holding of its Shows. In view, therefore, of the fact that in the year 1902 the present rotation of districts as settled in 1892 will have been completed, and that it will be necessary during the forthcoming year 1900 to come to a decision as to a meeting-place for 1902 in District G—the last of the series—the Council have appointed a Special Committee consisting of the Chairmen of the several permanent committees concerned in the administration of the shows (Finance, Veterinary, Stock Prizes, Implement, Showyard Works, and Dairy), with the Honorary Director, Sir Walter Gilbey, Mr. H. D. Marshall, and Mr. E. W. Stanyforth, to consider and report as to any modifications or alterations in the present show system which they may consider desirable after the present rotation is completed.

12. The Council have decided that the York Meeting shall open on Monday, June 18, and close on the following Friday evening. The Implement Yard and Dairy will be open to the public on the previous Saturday, June 16.

13. The final date for the receipt of entries in the Implement Department has been fixed for Thursday, March 15, 1900, although post entries at double fees may be tendered up to Saturday, March 31, 1900. For Live Stock, including Horses, Cattle, Sheep, and Pigs, the entries will close on Monday, April 16, at 10*s.* per entry; on Tuesday, May 1, at 15*s.* per post entry; and finally, on Tuesday, May 15, at 1*l.* per late entry. For Poultry and Farm Produce, the entries will close on Tuesday, May 1, at 2*s.* 6*d.* per entry, and, finally, on Tuesday, May 15, at 5*s.* per post entry. Double fees will be payable by Non-Members of the Society. An exhibitor will be permitted to make in the Classes for Live Stock and Poultry as many entries in the class as there are prizes offered in that class. Provision will be made for enabling exhibitors who have already entered animals to substitute for them entries of other animals in the same class up to Thursday, May 31, on payment of a registration fee of 5*s.* (Non-Members double).

14. The detailed Regulations for the Exhibition and Trial of Implements at York have now been settled. The following Prizes will be offered by the Society :—

General Purpose Horse-power Cultivators . .	Prizes of 40*l.* and 20*l.*
Self-moving Steam-Diggers	Prizes of 40*l.* and 20*l.*
Milking Machine	Prize of 50*l.*
Sheep-shearing Machine, to be driven by power other than Hand Power	Prize of 20*l.*
Sheep-shearing Machine, to be driven by Hand Power	Prize of 10*l.*

15. The Prize sheet for Stock, Poultry, and Produce has been definitely settled, and will be issued immediately. The Prizes offered in all departments (exclusive of Champion Prizes and Medals offered by various Breed Societies) amount in all to 6,620*l.* to which the York Local Committee contribute 1,676*l.* The special prizes offered by the York Local Committee include seven classes for Hunters, one for Hacks, six for Cleveland Bays, six for Coach Horses, eight for Hackneys, two for Ponies, two for Shetland Ponies, six for Polo Ponies, three for Harness Horses, and six for Draught Horses in harness to be exhibited on the Thursday of the Meeting only ; two classes for Highland Cattle ; one class each for Lincoln, Shropshire and Border Leicester Sheep, and two for Wensleydale Sheep. Classes are also offered for Stilton-shaped and flat-shaped Wensleydale or Cotherstone Cheeses, for Cleveland Cheeses and for Ryedale Cheeses.

16. The Classes for Live Stock provided by the Society itself will include Hunters, Cleveland Bays, Coach Horses, Hackneys, Ponies, Shires, Clydesdales, and Suffolk Horses. In the classes for Cattle, prizes will be offered for the Shorthorn, Hereford, Devon, Sussex, Longhorn, Welsh, Red Polled, Aberdeen Angus, Galloway, Highland, Ayrshire, Jersey, Guernsey, Kerry, and Dexter breeds and for Dairy Cows. The maximum age of Bulls competing for the prizes offered by the Society has been limited to four years, and that of Cows to six years. The Classes for Sheep will include Leicesters, Cotswolds, Lincolns, Oxford Downs, Shropshires, Southdowns, Hampshire Downs, Suffolks, Border Leicesters, Wensleydales, Kentish or Romney Marsh, Devon Longwoolled, Somerset and Dorset Horned, Cheviots, Blackfaced Mountain, Herdwicks, and Welsh Mountain. The prizes for Pigs will include the Large White, Middle White, Small White, Berkshire, and Tamworth breeds, as in previous years ; and two Classes have been added for Pigs of the Large Black Breed.

17. Prizes will also be given for useful descriptions of Poultry, including Table Fowls and Ducks ; for Butter ; for Cheddar, Cheshire, Stilton, Wilts, Double Gloucester, and other British Cheeses of 1900 make ; and for Cider and Perry. The British Beekeepers' Association will continue their prizes for Hives, Honey and Bee Appliances.

18. There will also be a competition open to the United Kingdom of Shoeing Smiths in two Classes—viz. for Hunters and Cart Horses—and Prizes amounting to 16*l*. will be offered in each Class. The Worshipful Company of Farriers have offered to present the Freedom of their Guild, free of cost, to the winner of the First Prize in each Class, provided the Judges consider that sufficient ability has been displayed. The Registration Committee of the Farriers' Company will also admit, free of charge, the First Prize winners in these Competitions to the Official Register of Farriers or Shoeing Smiths, and, on payment of the usual fees, all other competitors who shall duly satisfy the Judges of their efficiency.

19. As the result of the examination of students in cattle pathology (including the diseases of cattle, sheep, and swine) conducted by the Royal Veterinary College, Mr. G. Lockwood, of Poulton-le-Fylde, had been awarded the Society's silver medal, and Mr. H. S. Elphick, of 1, Brandling Park, Newcastle-on-Tyne, the bronze medal.

20. Except in the case of rabies, the present year has not witnessed any notable decline in the prevalence of the contagious diseases of the domesticated animals. The outbreaks of anthrax are below those of last year, but the number of animals attacked has been greater. In the case of glanders, the outbreaks are in excess of the number recorded at the same date in 1898, and the outbreaks of swine fever reported since the 1st of January last are only slightly below the number for the corresponding period of last year. Only eight cases of rabies (all in dogs) have been reported during the current year, as against sixteen at the same date in 1898.

21. The number of morbid specimens forwarded during the past half-year to the Department of Comparative Pathology established at the Royal Veterinary College by the aid of a grant from the Society was 147. During the same period experiments bearing on the nature and means of prevention of African "horse-sickness" have been carried out, and others relating to the value of tuberculin are being conducted by the aid of a special grant of 200*l*. from the Society.

22. During the past twelve months, members have submitted to the Consulting Chemist 802 samples for analysis. This number falls somewhat short of the 861 samples sent in 1898, when a slight excess over 1897 was reported. A very satisfactory general report is given by Dr. Voelcker as to improvement in the quality of linseed cake, both of English and foreign make, of basic slag and of ordinary manufactured manures; but there has been considerable deterioration in decorticated cotton cake. Attention is specially drawn to the necessity of exercising care in regard to the materials used in the manufacture of "compound" feeding cakes, to the fineness of grinding of basic slag, and the purchase of "blue vitriol" (sulphate of copper), which latter is frequently adulterated with sulphate of iron ("green vitriol").

23. The harvest results for each individual year of the Woburn experiments since their commencement in 1877 were published in the concluding number of the Journal of last year; and the experiments, with some modifications, have entered upon a fresh term. Feeding experiments upon the use of gorse for sheep, and on the early feeding of mangels to bullocks, were conducted during the winter of 1898–9, and the reports thereon have been published in the Journal. Experiments on the spraying of potatoes with "Bouillie Bordelaise," and on the prevention of "Finger and Toe" in turnips, have been continued, but were greatly impaired by the very unfavourable season for the crops in question.

24. The second year's crops relating to the experiments conducted at the Pot-culture station at Woburn, under the Hills Bequest, have been gathered, and will shortly be tabulated, as well as the results of other experiments of a general nature carried out at the station. All the stations under the Society's control, at which grass experiments are being made, have been visited during the past summer by the Consulting Botanist. A series of experiments on the eradication of charlock by the use of spraying solutions of sulphate of copper and sulphate of iron were undertaken by the Society in various parts of the country, and tests were made at the Woburn Pot-culture station as to the eradication of wild chrysanthemum, poppies, wild onions, and other weeds.

25. The Consulting Botanist reports that the superior quality of the seeds examined and tested during the past year has been maintained. Only one case of dodder in clover seed was observed. The more important grass and clover seeds have reached an average germination of over 90 per cent. The mixtures for laying down, which have been bought simply as mixtures without any statement or guarantee of their composition, have not been satisfactory, and in some cases have contained a considerable proportion of worthless weeds. An increasing number of inquiries has been received regarding plants supposed to be injurious to stock. Some of these proved to be innocent, but the larger number were dangerous plants. Advice has been given as to their properties, and the methods of dealing with them. Fungal diseases, affecting the vigour and in some cases the life of cultivated plants, have been investigated and advised on.

26. The work of the Zoologist's department is increasing, and the applications during the past six months have been unusually various in their nature, including cases of insect attack in the colonies. Some inquiries have been received with regard to certain insects and worms parasitic upon live stock, but most have had reference to attacks upon farm crops, stored agricultural produce, and especially fruit crops.

27. As the result of the Society's Examination in the Science and Practice of Agriculture, held from May 9 to May 13 last, the

following twenty candidates, placed in order of merit, gained First-Class Certificates. The first candidate (having obtained over three-fourths of the maximum number of marks, 1,500) was also awarded the Life Membership of the Society and the Gold Medal. The second, third, fourth, and fifth candidates (having obtained over two-thirds of the maximum number of marks) received the Life Membership of the Society and the Silver Medal.

1. JOSEPH HENRY HINCHCLIFF, Yorkshire College, Leeds.—(1200 marks.) *Gold Medal and Life Membership of the Society.*
2. LAWRENCE ABRAM, Durham College of Science, Newcastle-on-Tyne.—(1155 marks.) *Silver Medal and Life Membership of the Society.*
3. ADOLF H. DELLSCHAFT, South-Eastern Agricultural College, Wye, Kent.—(1128 marks.) *Silver Medal and Life Membership of the Society.*
4. SAMUEL SIMPSON, Wiswell, Whalley, Blackburn.—(1118 marks.) *Silver Medal and Life Membership of the Society.*
5. THOMAS NEWTON, Agricultural and Horticultural School, Holmes Chapel.—(1074 marks.) *Silver Medal and Life Membership of the Society.*

6 HERBERT WILLIAM ALLISON, Yorkshire College, Leeds.
7. FRED SMITH, Agricultural and Horticultural School, Holmes Chapel.
WILLIAM JACKSON, Agricultural College, Aspatria.
9. { ERIC ARTHUR NOBBS, The University, Edinburgh.
JAMES ERNEST THOROLD, South Eastern Agricultural College, Wye, Kent. }
11. JOHN HENRY BURTON, Durham College of Science, Newcastle-on-Tyne.
12. ROBERT GWILLIM, The Agricultural College, Aspatria.
13. JOHN EDWIN RIGG, Crake Side, Greenodd, Ulverston.
14. GEORGE RYCE, Agricultural College, Uckfield, Sussex.
15. { WARBURTON C. JARDINE, Glasgow and West of Scotland Technical College, Glasgow.
HUGH C. SAMPSON, Barnard Castle, co. Durham. }
17. JOHN CHRISTOPHER FRYER, The College, Reading.
18. HERBERT FREDERICK BENGER, South Eastern Agricultural College, Wye, Kent.
19. GEORGE BERNARD NICKSON, The Park Farm, Prestwich, Manchester.
20. ROWLAND GURNELL, University College, Nottingham.

28. The following seven candidates, having passed in Agriculture and in three of the four other compulsory subjects, received Second-Class Certificates :—

21. ALFRED SMITH, jun., The Agricultural College, Uckfield.
22. JOHN WILLIAMSON, Agricultural and Horticultural School Holmes Chapel.
23. WILLIAM SEPTIMUS HARRISON, Agricultural College, Aspatria.
24. JOHN ROBERTS, University College of Wales, Aberystwyth.
25. WILLIAM RICHARD LLOYD-WILLIAMS, Agricultural College, Aspatria.
26. JOHN HANNATH, University College, Nottingham.
27. PATRICK JOSEPH HANNON, Clifton House, Loughrea, co. Galway.

29. Twenty-one candidates presented themselves for the Annual Examination in the Science and Practice of Dairying, conducted jointly by the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland. Of the twelve candidates examined at Reading from September 25 to 28, the following six satisfied the Examiners, and therefore received the National Diploma in the Science and Practice of Dairying :—

MAUDE P. ASHBY, 110 Liverpool Road, Birkdale, Southport.
BESSIE LYON BROWN, Drumgley, Forfar, N.B.
ANDREW LOGAN, Midland Dairy Institute, Kingston Fields, Derby.
CHRISTINA M. BRYDIE MCDUFF, British Dairy Institute, Reading.
GEORGE BERNARD NICKSON, Park Farm, Prestwich, Manchester.
DORA ORR, The Harris Institute, Preston.

30. Of the nine candidates examined at Kilmarnock from October 2 to 5, the following five were successful :—

CHRISTINA D. FLEMING, Hawkwood, Strathaven, Lanarkshire.
WILLIAM LIMOND, Broompark, Glenluce, Wigtownshire.
MARY MACDONALD, 26 Old Edinburgh Road, Inverness.
WILLIAM STEVENSON, Boghead, Mauchline, Ayrshire.
BESSIE LENNOX WILSON, Finlayston, Ochiltree.

31. It was mentioned in the May report of the Council that an understanding had been arrived at with the Highland and Agricultural Society of Scotland for the holding of a joint examination for a National Diploma in Agriculture, to take the place of the separate examinations which have heretofore been conducted by the two Societies. The Regulations and Syllabus for this examination have now been settled and issued, and a National Agricultural Examination Board, consisting of representatives of the Councils of both Societies, has been created for the purpose of supervising the arrangements. The Scheme provides that candidates who pass the examination and obtain a certain percentage of the maximum number of marks will receive the National Diploma in Agriculture, and those who obtain a higher percentage of marks, the Diploma with honours, a Gold Medal being awarded to the best candidate on the honours list. The examination will be divided into two

parts, to be taken, as a rule, in two successive years. By the courtesy of the authorities of the Yorkshire College at Leeds, the first examination for the Diploma will be held in the Great Hall of the College on Monday, April 30 next, and four following days. The entries of candidates for this examination will close on Saturday, March 31, 1900.

By Order of the Council,

ERNEST CLARKE,

Secretary.

13 Hanover Square, W.
December 6, 1899.

REPORT OF EDUCATION COMMITTEE ON THE RESULTS OF THE EXAMINATION IN DAIRYING, 1899.

THE Committee have the pleasure to report that the Fourth Annual Examination for the National Diploma in the Science and Practice of Dairying was conducted jointly by the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland in September and October 1899.

2. The Examination for English candidates was held under the supervision of the Executive of this Society from September 25 to 28, 1899, at the Reading College and British Dairy Institute. The Examination for Scottish candidates was conducted on identical lines, but with different Examination Papers, at the Scottish Dairy Institute, Kilmarnock, from October 2 to 5, 1899, under the supervision of the Highland and Agricultural Society of Scotland.

3. Twelve candidates entered for the Examination at Reading, and nine for the Examination at Kilmarnock, all of whom were examined.

4. Of the twelve candidates examined at Reading, the following six have satisfied the Examiners, and will therefore be entitled to receive the National Diploma in the Science and Practice of Dairying:—

MAUDE P. ASHBY, 110 Liverpool Road, Birkdale, Southport.
BESSIE LYON BROWN, Drumgley, Forfar, N.B.
ANDREW LOGAN, Midland Dairy Institute, Kingston Fields, Derby.
CHRISTINA M. BRYDIE McDUFF, British Dairy Institute, Reading.
GEORGE BERNARD NICKSON, Park Farm, Prestwich, Manchester.
DORA ORR, The Harris Institute, Preston.

5. Of the nine candidates examined at Kilmarnock, the following five were successful:—
CHRISTINA D. FLEMING, Hawkwood, Strathaven, Lanarkshire.
WILLIAM LIMOND, Broompark, Glenluce, Wigtownshire.
MARY MACDONALD, 26 Old Edinburgh Road, Inverness.
WILLIAM STEVENSON, Boghead, Mauchline, Ayrshire.
BESSIE LENNOX WILSON, Finlayston, Ochiltree.

6. The Examiner in Chemistry and Bacteriology at Reading (Dr. J. A. Voelcker) reports that "although in only one instance has special acquaintance with the subjects been shown, yet I have been very well satisfied with the general knowledge possessed by the candidates, only one of whom, indeed, obtained less than the qualifying marks. There was much less of the vagueness of replies which I have noticed before, indicating, as it did, very imperfect understanding of the subject matter; and I think there has been a more intelligent grasp of the main points and facts of the sciences involved. This was especially noticeable, I considered, in the case of those candidates who had been referred back to their studies from a previous year; and the extra year's work has, I believe, been decidedly beneficial in their case."

7. The Examiners in General Dairying (Mr. John Gilchrist) and in Cheese-making (Mr. William McFadyean) have presented a joint report that "the successful candidates acquitted themselves in a very creditable manner, and will no doubt give a good account of themselves in the future. On the other hand, a number came forward unprepared, and were evidently unaware of the necessity of the practical experience and study which would enable them to secure such an important Diploma. We were impressed with the earnestness of all the students who came before us, and their evident desire to qualify themselves both practically and theoretically in all pertaining to Dairy work."

8. The thanks of the Royal Agricultural Society are again due to Mr. J. Marshall Dugdale, who personally superintended the Examination at Reading, to the authorities of the Reading College, and to the Committee and Officials of the British Dairy Institute, for the excellent local arrangements with regard to the general conduct of the Examination, and the provision of milk, cream, and utensils.

MORETON,

Chairman.

13 Hanover Square, W.
October 31, 1899.

EXAMINATION IN THE SCIENCE AND PRACTICE OF DAIRYING, SEPTEMBER 25–29, 1899.

QUESTIONS IN GENERAL DAIRYING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

(*Three hours allowed.*)

Nos. 1, 2, 3, and 4, and at least other six questions must be attempted.

* 1. You are asked to select a dairy farm of about 180 acres. Describe the kind of farm you would look for, stating the district, position, and the system of dairying you have in view. Suggest a suitable rotation of crops, and state what would be a desirable acreage to have under Hay, Pasture, and Roots.

* 2. Describe and compare the selection and feeding of the stock of milk-cows in the following systems of dairying: (*a*) Where the milk is sold as new milk. (*b*) Where the cream is separated and made into butter and the skim milk is fed to calves. (*c*) Where cheese is made.

* 3. Describe in detail what you would recommend as the best system of ripening small quantities of cream (without a separator) where churning is done twice a week.

* 4. Give some indication of the amount of fat which is present in thick and thin cream. What thickness of cream do you recommend for ripening, and also for churning? Give your reasons.

5. Describe fully what you consider to be the best method of curing butter which is to be kept for three months.

6. State all the operations that are required in the preparation of the land and the cultivation of a crop of swedes, and the costs per acre of these, and of manure and seed. Estimate the weight and value per acre of the crop produced.

7. Enumerate and describe the precautions you would take to prevent the infection or inoculation of milk by noxious bacteria.

8. Describe the management of, and give the cost of keeping, a shorthorn heifer for one year previous to date of calving.

9. What conditions of management and production would you impose on a farmer who sends his milk regularly to a creamery for butter-making?

10. Give the average composition of beans, linseed cake, and swedes, and describe their special advantages and disadvantages as food for dairy cows.

11. Specify the points you would allow when judging butter, and state how you would arrive at your awards.

12. You are about to purchase twenty hens for egg production and fattening purposes. What breed and at what age would you purchase? What kind and amount of food would you allow per day for twenty laying hens of this breed?

QUESTIONS IN CHEMISTRY AND BACTERIOLOGY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

(Seven questions only to be answered, among which must be the five marked *.)

(*Three hours allowed.*)

1. Discuss the most recent views as to the relative extent to which the fat of milk is derived from the carbohydrates, the albuminoids, or the fat of foods.

* 2. Set out comparative analyses of whole milk and separated milk, stating what is removed in the operation of separating, and showing to what

extent the other constituents of the milk are thereby affected. What effect will this have on the product (separated milk) regarded as a food material?

* 3. Describe the souring of milk, showing in what respects and under what circumstances the process is to be considered a chemical one, and in what way a bacteriological one.

4. How is condensed milk prepared? What are the difficulties and uncertainties associated with its purchase? How do these arise, and what prejudicial effects may they have in the utilisation of the material as an article of food?

* 5. What is the particular influence on dairy produce exercised by the following foods when given to milking cattle: Linseed cake, bean meal, oats, swedes, brewers' grains (wet), silage?

6. Give reasons for the practice recommended in the cleaning of dairy utensils to "first wash in *cold* water, then scald with *hot* water, and finally wash again with *cold* water?"

* 7. Exemplify the dependence of cheese-making upon the action of bacterial life. How might the growth of bacteria in cheeses be prevented, and what would be the result?

8. To what class of ferments does the active principle in rennet belong? What are the principal qualities of the ferments of this class that distinguish them from another large class?

9. In the "ripening" of cream for butter-making, what is it sought to effect and what to avoid?

* 10. Set out in the form of a chemical analysis the general composition of genuine fresh butter. What is butter-fat, considered chemically?

QUESTIONS IN CHEESE-MAKING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

(*Three hours allowed.*)

Not more than 10 of the following questions are to be answered.

1. From a herd of 50 Shorthorn or Ayrshire cows, what weight of cheese would you expect to make during the season, and what do you consider a satisfactory price for the make of cheese per cwt.—either *Cheddar*, *Cheshire*, *Leicester*, or *Derby*?

2. How long do you think a fine *Cheddar* or *Cheshire* cheese should take to ripen, and what percentage of loss in weight would you expect during this time?

3. Compare the ripening of the *Stilton* cheese with the same process in a *Cheddar* or *Cheshire*, and give details of the treatment of the two after leaving the hoops until they are fit to use.

4. Explain two of the best known tests for determining the amount of acid in, and before drawing off, whey. Is it necessary to always develop the same amount of acid at this stage? And under what circumstances would you vary it?

5. What do you know of the use of "Starter" in cheese-making? And how would you prepare one in your own dairy so as to have the best results in using it?

6. What difference in keeping qualities would you expect to find in a cheese made from curd too acid, as compared with another made from a curd with the proper amount of acid? And what are the defects in the former when cut?

7. Briefly explain the treatment of milk for *Stilton* cheese-making from the time it comes into the dairy until the curd is ready for vatting. Has the temperature any effect on the process, and if so, in what way?

8. Name some of the causes of having bad-flavoured cheese. What would you suggest to remedy or lessen the recurrence of such?

9. In the making of a *Cheshire* or *Cheddar* cheese, state the quantity of rennet you would use, the effects of using too much or too little, and the principal points to be observed in making.

10. What is meant by a porous curd? Name a very common cause of it. How could it be prevented?

11. Why is Shorthorn or Ayrshire cows' milk preferable to Jerseys' in the manufacture of pressed cheese?

12. Give your views of the best and most economical means of keeping the dairy and curing room at a uniform temperature, and reasons why temperature should be kept from fluctuating.

ANNUAL REPORT FOR 1899 OF THE CONSULTING CHEMIST.

The present Report, consequent upon the separation of the "experimental" from the "analytical" side of the Society's chemical work, in consequence of the establishment of the Woburn Experimental Station, deals only with matters referred to me by Members of the Society, and relates to analyses of the various samples submitted to me for analysis and report. The number of samples sent in the ordinary course by Members has been rather less than last year, viz. 802, against 861 in 1898. In addition, however, there have been 51 other samples analysed in connection with special matters of inquiry. Moreover, a large number of samples of milk, both whole and separated, were analysed in the Society's Laboratory, in connection with the awards in the Cream Separator trials and the Dairy Classes at the Society's Country Meeting at Maidstone.

Despite the falling-off in the number of samples sent, it can be said that the past year has proved quite as useful as its predecessor in showing the desirability of analytical examination. It is quite true that in staple articles purchased for farm use, such as linseed and cotton cake, mineral superphosphate, and the like, there is much greater security to the purchaser now than there was formerly, and also such ready and good supply as perhaps only occasionally to call for examination and verification of deliveries. But there nevertheless spring up from time to time new materials about which information is needed, and new forms of adulteration that have to be guarded against. It is in supplying such information that the occasional Reports issued by the Chemical Committee in the Minutes of the Council Proceedings serve a useful purpose.

Perhaps the chief features in the year's analytical work have been in connection with the extended use of basic slag, and the method of sale and purchase of "blue vitriol" (sulphate of copper), together with the detection of the unsatisfactory nature, in many cases, of the materials used in the manufacture of "compound" or so-called "feeding" cakes.

Basic slag has undoubtedly been used more generally, and

often to much advantage, more especially on poor, heavy land pasture. When first introduced as a manurial article the greater part of the basic slag produced in this country was sent abroad ; but I am informed that now quite two-thirds of the outturn is used here. At the same time, there has been a steady improvement both as regards the quality of the material supplied—*i.e.* its richness in phosphoric acid—and also in respect of the fineness of grinding—a most material point, and one which should never be overlooked. From time to time I have felt it right to alter the terms of our recommendation to purchasers of basic slag, each time in an upward direction ; and, while 14 or 15 per cent. of phosphoric acid and a "fineness" of 70 per cent. were, not long ago, all that could be demanded, a good quality sample will now give 17 per cent. or over of phosphoric acid ; and, as regards "fineness," a buyer may now always stipulate for having it of 80 per cent. standard.

The use of "blue vitriol" (sulphate of copper) for agricultural purposes has been considerably extended of late. It has long been employed, either alone or in different preparations of which it formed a constituent part, as a dressing for seed wheat. But of later years the spraying of the potato crop with "Bouillie Bordelaise" mixture, to guard against potato disease, has become more general ; and quite lately a further employment of sulphate of copper has been brought to the front in the spraying of corn and other crops infested with charlock, a solution of this salt being used, apparently with good result, for the purpose. Sulphate of copper is, however, a costly material, its price being, roughly speaking, 28*s.* per cwt., though this is subject to considerable fluctuation, according to the market. Hence it is frequently adulterated, and the somewhat similar appearance presented by the crystallised salt, sulphate of iron ("green vitriol"), makes the latter a convenient material for the purpose, while its much lower price—about 4*s.* per cwt., against the 28*s.* per cwt. of sulphate of copper—affords strong inducement for the substitution. The agriculturist, as is too often the case, has been made the victim of such proceedings ; and it has been diligently put about that by "blue vitriol" is meant, in the trade, not sulphate of copper—commercially pure—but a mixture of sulphate of copper with a greater or less proportion of sulphate of iron. To this mixture such names as "agricultural sulphate of copper," "blue compound," &c., have been given.

It cannot be too strongly pointed out that there is no excuse whatever for putting forward such a mixture and calling it "agricultural." Sulphate of copper is readily obtained, in a practically pure form, as the crystallised salt, and when sulphate of iron to any extent occurs with it the sulphate of iron must have been deliberately mixed for the purpose of adulterating the more costly material. Moreover, the two things do not serve the same purposes agriculturally ; for, while sulphate of copper has undoubtedly great value for grain-dressing preparatory to sowing, potato spraying, and charlock destruction, sulphate of iron is practically useless. It has been said that farmers will not pay the "small extra cost for the

pure material;" but of this there is no evidence in the cases that have been brought under my notice, and I have found that the purchasers were in each case under the impression that they were buying the genuine article and not a mixture. The bright blue colour of the sulphate of copper obscures the lighter and pale-green colour of the sulphate of iron, and, unless to an expert, the mixture of 20 to 30 per cent. of the cheaper salt with the more costly is hardly likely to be noticeable. In cases that have come under my notice I have found 20 per cent. and 30 per cent., and even as much as 90 per cent., of admixture of sulphate of iron, while in one instance already reported the so-called "blue vitriol" consisted entirely of *green* vitriol (sulphate of iron), coloured with Prussian blue so as to make it look like *blue* vitriol.

The third special feature is one to which I have had occasion to refer previously—the unsatisfactory nature, in many cases, of the materials used in the manufacture of "compound" or mixed "feeding" cakes. I do not intend by any means to class all these together; for there are many excellent makes at the farmer's command, and I am far from denying that they serve a good purpose and prove a convenience to the feeder of stock. But, undoubtedly, it is too frequently the case that because a cake is a compound it is considered legitimate to put in materials of doubtful character and of little or no feeding value, and to incorporate in the cake sweepings of mills, granary floors, &c. Too much stress, also, is often laid by the seller upon the actual figures that such a compound cake will show on analysis, and too little regard is paid to the wholesome character of the materials composing it. Thus, in the course of this year, I have found such materials as coffee husks, grain screenings, and weed seeds of numerous kinds used in the manufacture of compound cakes. Not unfrequently, too, as I have reason to know, materials that are damaged and unsound are employed; and because the whole is cooked up together, or the defects obscured with treacle and condiments, it is thought that they may be incorporated quite rightly in "compound" cake.

I cannot too strongly urge farmers to be more particular as to the actual materials employed in these compound cakes, and to be less concerned for a "high-sounding" analysis.

In regard to the different classes of samples submitted, there has been the same diminution noted last year in the case of linseed cakes, a falling-off warranted to some extent by the general improvement in this class of cake. Common cotton-cake has been used perhaps more freely, decorticated cotton-cake, on the other hand, being hard to get and of quality inferior to that obtainable in previous years. Fewer samples of superphosphate, bone meal, fish and Peruvian guanos have been sent, but basic slag samples have still further increased in number. There seems still a confiding trust, on the part of farmers, in the good quality of nitrate of soda and sulphate of ammonia, though, seeing that these are high-priced articles, it is hard to believe that out of 11,000 members belonging

to the Society, there are only twenty-three who have troubled to avail themselves of the security afforded them, by the nominal outlay of 5*s*. for an analysis of a delivery for which they may pay from 10*l*. to 50*l*. or more. I had occasion in March last to report a deficiency of over 5 per cent. in a sample of nitrate of soda, the guarantee of which was "95 per cent. pure" nitrate of soda.

There have been rather fewer soils analysed in the past year, but waters once more occupy a prominent position on the list of samples examined. The complete list of these is given at the end of this Report.

A. Feeding Stuffs.

1. *Linseed Cakes.*

There has been continued improvement regarding this class of cake, and I feel much satisfaction that the continued efforts made by the Society to inform the agricultural public of what to guard against when purchasing seem to have borne fruit, so far at least as the members of the Society are concerned. I might go now to the extent of saying that it is an exception to find a linseed cake impure, a statement I should have been unable to make a few years back. With this, too, there has been an improvement in the general quality or richness of the cakes sent to me. There has apparently been more disposition to buy the better English cakes, rather than those of foreign make. At the same time I must allow that the latter, and in particular the Russian cakes, have, as a whole, improved as regards purity, freedom from weed seeds, &c. The price of English-made cake has varied from about 7*l*. 5*s*. per ton (May to August) to 8*l*. (January, February, and October), rising to 8*l*. 10*s*. in November.

While, as a rule, linseed cakes have been of better quality, some very hard pressed ones, low in oil, come at times under notice. Two such gave :—

	A	B
Percentage of oil	7·47	6·96

A was a cake of American manufacture. B cost in March 8*l*. 5*s*. per ton. The purchaser of the latter had subsequently an offer of another cake, guaranteed "pure, and to contain 14 per cent. of oil," at 7*l*. 17*s*. 6*d*. per ton—a manifestly much better purchase.

2. *Cotton Cakes.*

Undecorticated cotton cake has been more satisfactory this year than previously. There have been fewer complaints of uncleaned seed and excessive or coarse husk, though such cases still occur from time to time. In one instance I found 60 per cent. of coarse husk and wool in a cotton cake, and 43 per cent. in another, while in a cake made from well-cleaned seed there was only 21·4 per cent. of coarse husk and wool.

The price of undecorticated cotton cake has remained steady throughout the year at about 5*l*. per ton.

Decorticated cotton cake has, on the other hand, deteriorated very considerably in quality, and the nice, bright, and soft decorticated cotton cake of earlier years, which gave 15 and 16 per cent. of oil, and was so relished by stock, appears to be no longer on the market. The oil in decorticated cotton cake now purchasable seldom reaches 10 per cent.; moreover, there has been a marked increase in the amount of husk left in the cake, and whereas there used to be only about 4 per cent. of husk, now 7 and 8 per cent. are common proportions. Indeed, I have had cakes sent me as "decorticated" which it was hard to tell from undecorticated. Also the colour of the cakes made up by grinding hard natural cakes and pressing them together again is never that of the new ones, and they assume often a brown and stale look. Most valuable food though I still hold decorticated cotton cake to be, I do not think the changes I have noted are to the benefit of the farmer. "Made-up" cakes, like compound cakes, are well enough in their way, and it is better, perhaps, to use them than to block an animal up with hard lumps and cake like paving-stones; but, at the same time, one never knows with "made-up" cakes whether the materials were originally sound or not. In one instance I found that a large firm of manufacturers mixed salt with their decorticated cotton cake made up in the way I have described, and they said they did so to give a relish to the cake. My advice to the purchasers was (1) to give the salt to the cattle themselves if they wanted it, but not to pay for salt and moisture at decorticated cotton cake price; and (2) to see that they had sound feeding materials that wanted no "relish." Too often, I know, salt, condiments, preservatives, and the like are added in order to cover inherent defects of food.

The price of decorticated cotton cake has ranged from about 6*l.* to 6*l.* 15*s.* per ton throughout the year.

3. *Compound Cakes.*

Of these I have already spoken at some length. Coffee husks (a useless feeding material) have in several instances been found to be present, and among weed seeds the following: spurry, cockle seed, rape, mustard, polygonum, while in many cases sand, derived probably from sweepings of floors, screenings, &c., has been found in excessive quantity. If clean and good materials are used, compound cakes should not have more than about $\frac{1}{2}$ per cent. of sand, certainly not over 1 per cent. Three compound cakes were sent me in October, from different purchasers, each of which contained 4 per cent. of sand or more. In this connection it is well to point out that, under the provisions of the Fertilisers and Feeding Stuffs Act, it is an offence to sell as "food for cattle" that which contains ingredients deleterious to cattle, or which contains ingredients "worthless for feeding purposes" if the presence of these has not been declared beforehand. It would be well if action were taken on some such cases as I have mentioned, but the machinery of the Act is, unfortunately, far too cumbersome.

4. "*Gluten Refuse.*"

A material sold under this name, the refuse from starch-making, was submitted to me. It contained :—

	Per cent.
Moisture	8·72
[1] Albuminous compounds	21·34
Mineral matter (ash)	2·19
[1] containing nitrogen	3·41

The material was, no doubt, mainly the nitrogenous matter removed from the grain in the making of starch. It was slightly acid, from the acid used in the extraction of the starch, and it was in a hard, dried-up condition that would necessitate grinding up. The cost was given as 4*l.* per ton, which was certainly far too much.

5. *Coffee Husks.*

These have been mentioned as occurring in compound cakes, but I found them also in a sample of undecorticated cotton cake sent me, and so nearly did they simulate part of the husk of the cotton seed that it was only after careful inspection that I could notice their presence. I feel sure that they have often been overlooked in the past. An analysis of them is given in my Annual Report for 1898.

B. Fertilisers.

1. *Superphosphate.*

The supply of this has been very good, alike as regards quality and condition, and there has been an almost entire absence of complaint regarding it. The price has been rather higher, but this is not to be wondered at, seeing that previously in many cases, owing to the competition of manufacturers, farmers were receiving it at less than cost price. Instances of cheap purchases are :—

	A. Per cent.	B. Per cent.
Soluble phosphate	29·66	34·92

A cost 49*s.* per ton, delivered at Driffield, Yorks, and B cost 61*s.* 6*d.* per ton, delivered at Ferryhill, Durham, both in April, the unit of soluble phosphate costing respectively 1*s.* 8*d.* and 1*s.* 10*d.* per ton.

2. *Dissolved Bones, Compound Manures, &c.*

The sale of these has, generally, been much more satisfactory than in the past, and dissolved bones have, as a rule, been found to be what they should be, viz. raw bone and acid only. A good and cheap sample of such was the following :—

	Per cent.
Moisture	7·49
[1] Organic matter and water of combination	34·04
Monobasic phosphate of lime	7·43
(equal to tribasic phosphate of lime rendered soluble by acid	11·64)
Insoluble phosphates	26·69
Sulphate of lime, &c.	23·56
Insoluble siliceous matter	·79
	100·00
[1] containing nitrogen	3·21
equal to ammonia	3·89

This, delivered at Darlington, cost, in April, 4*l.* 10*s.* per ton, for cash for a 5-ton lot, which was decidedly cheap.

3. *Bones, Bone-meal, &c.*

Bones generally undergo a process of partial boiling, for the purpose of extracting the fatty matter from them. This is, in a measure, necessary when the bones are subsequently used for dissolving with acid, in order to make dissolved bones. The process of boiling, if not carried too far, should only remove the fat and grease attaching, but not take out the nitrogenous matter. In the "steaming" of bone, which is a different process, the nitrogenous matters are for the greater part removed, to form glue, size, &c.; and "steamed" bone, or (as it used to be, though incorrectly, called) "boiled" bone, is left. It is well that these distinctions should be understood, and the use of the terms "raw bone" and "degelatinised bone"—to represent respectively bones which have had only the fat removed, and those from which the nitrogenous matters have in great measure been removed also—is to be recommended. Occasionally samples of raw bone, which are crushed and sold as such, without any preliminary treatment of boiling, &c., are met with. The following are analyses of such:—

	A Per cent.	B Per cent.
Moisture	9·14	8·28
[1] Organic matter	31·36	34·07
Phosphate of lime	51·01	50·12
Carbonate of lime, &c.	7·74	6·33
Sand	·75	1·20
	100·00	100·00
[1] containing nitrogen	4·06	4·12
equal to ammonia	4·93	5·00

4. *Peruvian Guano.*

Though still procurable, and at very reasonable prices, Peruvian guano hardly appears to be used to such an extent as formerly. A sample of the more phosphatic kind which gave—

	Per cent.
Ammonia	2·40
Total phosphates	71·30

was exceedingly cheap at the price, in April, of 4*l.* 10*s.* free on rail. Another sample, analysing—

	Per cent.
Ammonia	2·36
Total phosphates	67·37
Potash	1·07

was likewise cheap at 5*l.* per ton, in Liverpool, also in April.

High qualities, giving 12 to 14 per cent. of ammonia, are still obtainable at fair rates.

5. *Basic Slag.*

The higher quality and superior grinding of this material have been referred to already. A good sample was the following :—

	Per cent.
Phosphoric acid	18·84
equal to tribasic phosphate of lime	41·12
Fineness	90·00

This cost 41*s.* 6*d.* per ton, delivered near Shrewsbury. But care has to be exercised in the purchase of basic slag, which may not by any means always come up to the guarantee given. The following are instances of low quality or inferior grinding :—

	A Per cent.	B Per cent.	C Per cent.
Phosphoric acid	10·41	14·12	8·69
equal to tribasic phosphate of lime	22·72	30·82	18·98
Fineness	82	70	56

6. *Soot.*

Soot is always of variable quality, and, when used, as it often is, for top-dressing of cereals, it is important that the active constituent, sulphate of ammonia, should be present in fair quantity. The two following materials were offered, each as "soot," and at the same price, viz. 2*l.* per ton. As the analyses show, they were very different.

	A Per cent.	B Per cent.
Moisture	20·60	6·64
[1] Organic matter and salts of ammonia	25·47	68·26
Oxide of iron, &c.	17·94	10·73
Sand	35·99	14·37
	100·00	100·00
[1] containing nitrogen	·83	4·65
equal to ammonia	1·00	5·64

The first-named was a very poor material, and, from its poverty in ammonia, not at all suitable in ordinary quantities for a top-

dressing for wheat; whereas the second sample was a very good one indeed, and well worth the money.

7. *Miscellaneous Fertilisers*

(*a. Carbide Refuse; b. Lawn Sand*).

(*a*) The extension of the system of acetylene gas lighting for country houses led to the suggestion on the part of a member of the Society that the calcium carbide refuse might have special manurial value. A sample of the refuse sent to me gave on analysis :—

	Per cent.
Lime	45·95
Oxide of iron and alumina	·78
Silica	3·91
Water, &c.	49·36
	100·00
nitrogen	·29
equal to ammonia	·35

This had no practical value beyond that of the lime contained in it, and was, moreover, not in a condition capable of ready application.

(*b*) A material sold as "Lawn Sand" is believed to have very potent powers in destroying plantains and other weeds on lawns. A sample sent me for examination was found to consist practically of ammonia salts (sulphate of ammonia) and sand, the analysis being :—

Moisture and organic matter	5·19
[1] Sulphate of ammonia	54·12
[2] Mineral matter	40·69
	100·00
[1] containing nitrogen	11·48
[2] including sand	31·20

The price of this was 34*s*. per cwt., so that sulphate of ammonia at 10*s*. per cwt. would go nearly twice as far and cost only about one-third the price. Like many other materials of its class, what the "Lawn Sand" practically does is to shrivel and burn up (as ammonia salts in excess will) the plants on which it immediately falls, and subsequently, when the excess is washed away, the ammonia salts exercise a forcing effect upon the grass around.

The following is the List of Analyses made for Members of the Society for the twelve months, December 1, 1898, to November 30, 1899 :—

Linseed cakes	94
Undecorticated cotton cakes	40
Decorticated cotton cakes	26
Compound feeding cakes and meals	59
Cereals	5
Dried grains	5
Superphosphates	53
Dissolved bones and compound artificial manures	37
Raw and degelatinised bones	27
Peruvian guano	27
Fish and meat guanos	22
Basic slag	30
Nitrate of soda	15
Sulphate of ammonia	8
Potash salts	8
Salt	1
Shoddy	30
Hoofs and horns	5
Soot	3
Rape dust and manure cakes	5
Limestone	2
Creosote	4
Butter, milk, and cream	33
Waters	140
Soils	18
Miscellaneous	45
Total	802

J. AUGUSTUS VOELCKER.

13 Hanover Square, W.

ANNUAL REPORT FOR 1899 OF THE ZOOLOGIST.

INTRODUCTION.

THE applications dealt with by the Zoologist during the past year have been unusually varied in character. The inquiries have had reference to more than fifty different species of animals, for the most part injurious insects and parasitic worms. In many instances, of course, the same attack has been reported from various localities, but no pest would appear to stand out very conspicuously as characteristic of the past season. The "pear midge," *Diplosis pyrivora*, seems to be annually encroaching upon new orchards, and special attention is called to this pest in the present report. At the same time an attempt is made to assist the fruit-grower to distinguish the different fruit-eating pests of the apple and pear, which are constantly confused.

It may be mentioned that in some cases advice has been sought

by members of the Society with regard to insect pests in foreign lands.

Horse Bot-flies.

In May some grubs taken from a horse were sent for identification and advice. They proved to be the larvæ of the less common horse bot, *Gastrophilus hæmorrhoidalis.*

This species and the more familiar bot-fly *G. equi*, have, broadly speaking, the same habit of life—that is, they both lay eggs on the exterior of the horse, attaching the eggs to hairs. The hatching grubs cause an irritation which induces the horse to lick the spot, and thus convey the larvæ to its stomach, where they fix themselves and remain for a considerable time, feeding upon the products of the inflammation they set up. When mature, they pass out by the rectum and turn to pupæ in the ground, and from these the fly emerges in due time.

There are certain differences, however, between the habits of the two species. The common bot usually attaches its white eggs to the fore limbs of the horse, and the whole period passed by the grubs in the alimentary canal is spent in the stomach. *G. hæmorrhoidalis* lays its eggs, which are dark-coloured, on the hairs of the lips, and the grubs let go their hold in the stomach some time before they are ready to leave the horse, and, passing down the intestine, fix themselves for a period in the rectum, near the anus. In this position they may attract attention, so that the attack is more readily observed than in the case of the common bot, which may easily pass out unnoticed in the droppings.

The bot grubs vary in appearance during their growth, but when nearly mature they are bottle-shaped creatures with hooked heads, and double rows of hooked spines on all the rings except the last. The spiracles, or breathing holes, are on the blunt hind end of the grub. The common bot is whitish, but the grub of *G. hæmorrhoidalis* is reddish, and not so strongly spined, as well as being somewhat smaller.

Horses not frequently groomed, and spending much time in the fields, are most subject to attack.

Occasionally, bots have been known to stop on their way to the stomach and attach themselves to the orifice of the breathing tube, causing much disturbance of the respiratory process, and even asphyxia.

There is very great difference of opinion as to the amount of injury inflicted by the bots. Frequently the stomachs of horses which have died from other causes are found to contain numbers of the grubs, whose presence, during life, was not in the least suspected. The irritation they set up cannot fail, however, to be detrimental to the horse's health, even where no ill effects are obvious. The fact seems to be that a horse in good condition and well fed can endure the presence of numerous bots in the stomach without great inconvenience, but if the animal is in poor condition, gastric enteritis, perforation of the stomach, and death may result.

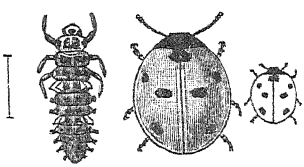
The appearance of a bot-infested horse's stomach, when opened, often gives rise to a curious misconception. The left sac, where the bots establish themselves, is normally different from the right in the nature of its lining; but this difference is very naturally attributed to the action of the grubs, which seem, to those unacquainted with the facts, to have entirely modified the walls of the stomach. It is only at the points where their hooked heads are inserted that the inflammation is set up, and there is no alteration of the general surface.

Where there is reason to suspect the presence of bots a veterinary surgeon may be consulted, but it is seldom advisable to dose the animals, because the disease will probably be recognised for the first time when the grubs are on the point of leaving, and measures to ensure their departure are superfluous. In the case of *G. hæmorrhoidalis*, if the grubs are observed in the rectum they should be removed by hand, or by an enema of soapy water, or they may set up serious disturbance in that region.

Careful grooming and the avoidance of fly-infested pastures are the most important considerations, and if a horse is noticed to be passing out grubs in May, measures should be taken to prevent the grubs escaping into the ground and giving rise to a new brood of flies.

Ladybird Larvæ.

A season never passes without specimens of ladybird larvæ, found on turnip-leaves, and suspected of doing injury to them, being sent to the Zoologist for identification and advice. As these are among the most useful of insects, it seems desirable that their appearance should be better known, and their utility more generally recognised.



Seven-spot ladybird and its larva, enlarged (Natural size indicated).

The real cause of the injury of which they are most commonly accused is the large fleshy earth-coloured grub of the turnip moth (*Agrotis segetum*), which excavates large holes in the roots, and often bites the tops completely off. This pest, however, is nocturnal, hiding underground in the daytime, and thus eluding the search of the farmer, who finds the injured plants infested by grubs which he naturally sets down as the cause of injury, but which, in reality, are in search of the green-fly from which turnip-plants are seldom entirely free.

The ladybirds themselves are sufficiently well known, and generally recognised as friends.

There are two extremely common species in this country—one large, with its bright red wing-cases marked with seven black spots (*Coccinella 7-punctata*), and one smaller and very variable in colour, sometimes red, with a black spot on each wing-cover and a whitish marking behind the eyes, and sometimes black marked with red.

Both species lay little clusters of yellow eggs beneath leaves

where green-fly are present, and these hatch out into slaty-grey grubs with little tubercles and yellow spots upon them, and with six conspicuous legs. They never do the slightest harm, but voraciously attack the green-fly, attaining their full growth in about three weeks, when the grubs of the larger species measure about one-third of an inch in length.

They then attach themselves by the hind extremity to the leaves, and change to chrysalids of characteristic shape and colour, with orange-coloured spots on the back, and from these, in due time, the ladybirds emerge, and continue, though less ravenously, the task of annihilating the green-fly.

In all parts of the world they are among the most determined enemies of the *Aphidæ* (green-fly) and the *Coccidæ* (scale insects), and when a new scale insect has been imported into a country it has sometimes been found possible to exterminate it by seeking its chief ladybird enemy in its native country and introducing it into the newly infested area. Thus the destructive orange scale known as *Icerya Purchasi*, introduced into America from Australia, was entirely cleared off by a large ladybird, *Vedalia cardinalis*, imported from the same country for the purpose.

This method of combating a pest is, of course, only applicable when it has been newly introduced. The "green-fly" or "scale" finds abundance of food at hand, and none of its natural enemies, and if climatic conditions are favourable it may do immense harm. When its enemy is imported, it, in its turn, finds abundant food, and an entire absence of the insects which keep it in check in its own land. It feeds on the green-fly until it is exterminated, and then perishes for want of food, and in this case there is no fear of the disastrous results in unlooked-for directions which have sometimes attended the introduction of animals into a new country.

Where both the ladybird and its victim have been long established in a country, a balance has been arrived at which may be temporarily disturbed, but is quickly restored.

Occasionally, exotic species of ladybirds are accidentally brought into this country. They are always welcome, and should be encouraged to obtain a footing if possible, as the experiment is free from danger. A specimen sent last March by a member of the Society for identification, proved to be a Cape species known as *Chilomenes lunata*.

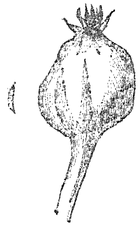
FRUIT-EATING PESTS OF THE APPLE AND PEAR.

1. The Pear Midge.

(*Diplosis pyrivora*, Riley.)

This insect is gradually becoming so widespread and serious a pest that it is important that its life-history and the nature of the injury done by it should be better known to English fruit-growers. Specimens of injured fruit have been received from Cornwall, Sussex, Kent, Worcestershire, Hereford, Cambridge, and Norfolk.

Its presence in England was first determined in 1893, and now it is annually occurring in new localities, and has already obtained a footing in many parts of the country. One of my correspondents, in sending the pest for identification, says that it has infested one particular tree for the past fifteen years.



Pear infested by the pear midge, with one of the maggots natural size

Soon after its introduction from France into America, which is believed to have taken place in 1877, its spread was remarkably rapid, and it quickly became recognised as a formidable orchard pest. Here its progress is slower, nor does it spread with great rapidity from tree to tree in an infested orchard; but it is clearly capable of thriving in England, and unless checked may, in time, do incalculable injury. The comparative slowness of its progress meanwhile renders it more possible to stamp it out where its first appearance is not allowed to escape observation, but want of familiarity with the injury it causes often results in the attack being overlooked until several trees have become infested, and the disease is much more difficult to eradicate.

A short account of the insect was given in the Annual Report of the Zoologist for 1896 (Vol. VII. of this series of the Journal, p. 768), but as several cases have arisen since that date in which it was not recognised, and had even been allowed to remain for some time unmolested, it seems desirable to call serious attention to it once more.

What is first observed is the stunted and distorted appearance of the young pears in May, for though the blossom is attacked the fruit is not prevented from "setting," and the full effects are not noticeable until the pears are almost the size of cherries. They usually appear cracked and misshapen, and, if opened, will be found to contain numerous little white grubs, not unlike cheese maggots, and possessing a similar power of jumping by placing head and tail together, and separating with a spring.

The further growth of the fruit is arrested, and in cases of severe attack no crop results.

The life-history is briefly this. The midge, a small black gnat-like fly, appears in April. The female can extrude from its hind end a long tubular organ, the ovipositor, with which it pierces the unopened flower-buds, introducing its eggs. These hatch out into maggots, which eat into the core of the young fruit immediately after it is set. The maggots are white, and tapering to either end, and, under the microscope, a small pinkish or brown forked protuberance may be seen projecting beneath them, a little way behind the head.

How long they remain in the pear depends on circumstances, as they do not always quit the fruit as soon as they are fully grown, which is usually towards the end of May. Either then, or in June, they desert their quarters, their departure being accelerated by rain.

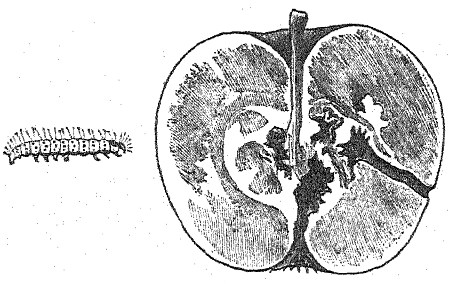
Their jumping powers enable them to spread themselves over the ground, into which they eventually burrow, to turn to chrysalids or *puparia*, and there they remain till the following spring, when the flies come forth to attack the new flower-buds.

Treatment.—Fruit-growers unfamiliar with this pest are earnestly advised to inspect their pear trees carefully next May, and to take immediate action if the disease is found to be present in ever so small a degree. It is easily recognised by the stunted fruit, and the small jumping maggots they contain. If confined to one or two trees, it is well worth while to strip off the whole of the fruit and burn it; but to be effectual this must of course be done before any of the maggots have left the pears and entered the ground. If the attack is observed too late for this measure, it is well to know that a heavy dressing of kainit beneath the trees has been found to destroy the puparia, and to prevent the emergence of the midge during the following season.

2. The Codlin Moth.

(*Carpocapsa pomonella*, Linn.)

The apple worm or caterpillar of the codlin moth is by far the most common and familiar pest of the fruit of the apple tree in this country. Probably no fruit-grower—or fruit-eater—is unacquainted with the whitish or flesh-coloured grub which burrows into the apple, and fills the core with its bitter and nauseous excreta. In cider orchards I have sometimes tried in vain to find a single "windfall" which did not show traces of its work. The researches of Mr. M. V. Slingerland, of the Cornell University Agricultural Experiment Station, N. Y., have lately furnished us with much more definite information than we previously possessed with regard to the life-history and especially the egg-laying of this insect.



Fully-grown larva of the Codlin moth and infested apple.

It has always been asserted that the moth lays its egg in the calyx, or crown of leaves which represent the remains of the blossom at the top of the young fruit. It appears that this is seldom the case, but the tiny white eggs, the size of a small pin's head, are to be found indiscriminately at any point on the smooth surface of the apple, or even on the leaves which form a cluster round the fruit. This usually takes place in June. The caterpillar hatches out in a week or ten days, and is at first white, with black

head, and a dark patch behind the head, and at the tail. It is at first, of course, very small, not more than one-sixteenth of an inch in length. It does not enter the fruit at the point where the egg was laid, but wanders in search of a crack or fissure, or finds its way to the calyx, where it obtains most ready access to the interior of the fruit. The brown mass of excreta thrust out at the calyx end is very characteristic of the early stage of attack. It is while feeding in the calyx that it is most liable to destruction by poisonous dressings.

After a few days it bores straight to the core, where it spends most of the time (three or four weeks) that it passes within the apple. Before it has quite attained its full growth, it burrows straight for the exterior, reaching the surface at any point, but usually on the side of the apple. In this tunnel it remains till it has attained its full size of three-quarters of an inch, when it is usually pink in colour. Its presence is indicated by the excreta which are constantly thrust out. By this time the fruit has generally prematurely ripened and fallen, and the worm soon pushes aside the plug of pellets and leaves the apple.

For some time the caterpillars wander about in search of a hiding-place in which to pass the winter. They spin cocoons in any convenient shelter near at hand—if possible on the tree trunk itself—and pass the winter in the caterpillar state. They turn to chrysalids in the spring, but the moths are very irregular in the date of their appearance and egg-laying, and consequently caterpillars are to be found simultaneously in very different stages of growth.

Treatment.—(1) No mitigation of this pest can be looked for as long as windfalls are allowed to remain lying beneath the trees, as they almost universally are, especially in cider orchards. The measure of the first importance is the immediate gathering up of fallen apples, and either destroying them, or keeping them in a bin where the caterpillars can be dealt with when they emerge and spin their cocoons. Slingerland says: "Hundreds of cocoons have been found in a single barrel, and in one instance in California the openings in a fruit room were screened (with mosquito netting), and nearly 16,000 Codlin moths were thus trapped and killed between the middle of April and the end of August, nearly 1,000 being caught in a single day, June 15th."

(2) A useful subsidiary measure is banding the trees in July. The object here is not, as in the case of the Winter moth, to prevent the caterpillar climbing up the tree. It is, on the other hand, to provide an attractive shelter for the caterpillars in search of winter quarters, and the bands, which may be of hay or rags, or any similar material, are removed in the autumn, and destroyed with the caterpillars they contain.

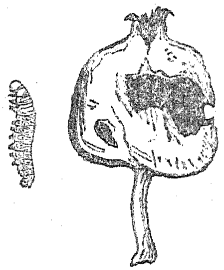
(3) Good results have been obtained by spraying the fruit, within a week of the falling of the blossom, with Paris green. One pound of Paris green and two pounds of freshly slaked lime are stirred in 160 gallons of water, and administered as a fine spray. This kills

the young grubs which are feeding in the calyx, but is of course useless at a later stage, when they have reached the core of the fruit.

3. The Apple Sawfly.

(*Hoplocampa testudinea*, Cameron.)

The work of the apple sawfly is but seldom the subject of inquiry in this department, but this is probably due to its rather close resemblance to that of the Codlin moth, with which it is no doubt frequently confounded. Nevertheless it is readily distinguished on careful examination.



Larva of apple sawfly (natural size) and injured apple.

Only the young fruit is attacked, and the borings are irregular, and rather in the form of large excavations. The injury is accompanied by a very disagreeable smell. The grubs, of which several may be found in the same apple, are of the regular sawfly type and may be distinguished from the Codlin caterpillar by their more numerous legs. No moth caterpillar possesses more than five pairs of "sucker-feet" in the middle region of the body; the grub of the apple sawfly has six.

Life-history.—The apple sawfly is a four-winged yellow-bodied insect of inconspicuous appearance, which appears in the middle of May. All insects of this group possess a peculiar apparatus in the form of a double saw—whence their popular name—by means of which they cut holes in leaves, stems, or fruit, for the reception of their eggs. By this the newly set apples are pierced, and eggs inserted, the wound being distinguishable as a small orange-coloured spot.

The grubs which hatch out feed within the young fruit, but wander to adjacent apples if there is a likelihood of their original victim falling before they have attained their full growth.

When mature (early in July) they measure half an inch in length, and they then drop to the ground, and burrow to a depth of three or four inches, spinning cocoons, from which the sawflies emerge in the following May. The actual pupa or chrysalis state seems to be short, and the insect spends the winter as a caterpillar within the cocoon. Grass orchards do not suffer so much as those in which the ground under the trees is cultivated.

Treatment.—Where practicable, the most satisfactory treatment of sawfly attacks, where the pest spends most of the year a very few inches below the ground, is the removal and destruction (by burning or deep burying) of the surface earth in the autumn. The gooseberry and currant sawfly, for instance, can be completely eradicated by this means. If this is impracticable, measures should at least be taken to prevent as far as possible the emergence of the flies. Frequent disturbance of the ground during the autumn and

winter would have this effect, and if this is undesirable, something might be done in the way of a top-dressing such as has been found so serviceable in the case of the pear midge.

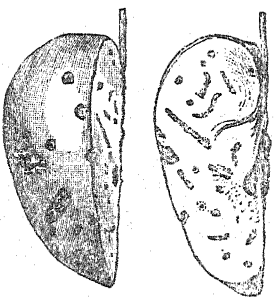
Spraying the young fruit with Paris green is calculated to kill such of the grubs as are changing their quarters, and thus to diminish the injury.

This insect must not be confounded with the "Pear and Cherry sawfly," which has a different habit. Its grubs, popularly known as "slug-worms," attack the leaves of these trees, but do not injure the fruit.

4. The Apple Tineid.

(*Argyresthia* sp.)

Another very distinct apple-boring attack has been present to a slight extent in Devonshire during the last few years, and the trouble experienced in America from the work of an allied insect makes it desirable that its progress should be kept under observation. The very small winding burrows which perforate the whole fruit cannot for a moment be confounded with the injury done by the Codlin moth or the apple sawfly. The cause of injury is the caterpillar of a small Tineid moth, probably of the genus *Argyresthia*, but the species has not yet been identified.



Segment of infested apple.

5. The Apple Case-bearer.

(*Coleophora nigricella.*)

Last June complaints were received of some slight amount of injury to apples and pears by a grub which proved to be the larva of *Coleophora nigricella*. The caterpillars of the moths of this genus have the curious habit of carrying about with them a case, after the manner of caddis-worms, and one of them, known as the "Cigar case-bearer," has attracted considerable attention in America from its orchard depredations. There is no reason to anticipate any particular danger from the present insect, whose presence has long been known in this country, though I am not aware that it has been previously recorded as injurious.

LARCH-TREE PESTS.

(*Chermes laricis*, Hartig ; *Hylobius abietis*, Linn.)

Several complaints have been received of injury to young larch plantations by two distinct pests, the "Larch-bug" (*Chermes laricis*) and the "Pine-weevil" (*Hylobius abietis*), and it seems desirable to

give a short account of the life-history of these insects and the means which have been found most efficacious in keeping them in check.

THE LARCH-BUG.—This is a plant-louse, of the family Aphidæ, which is often to be seen overrunning larch plantations from May to August. It does not confine its attacks to the young trees, though these suffer most. On the older larches only a comparatively small proportion of the tree is sufficiently tender to be subject to injury from the bug. The male chermes is not known with certainty, but it probably appears for a short time only in the autumn, and by its union with the female gives rise to eggs from which hatch out the "mother" chermes which survive the winter, and found colonies in the spring by laying clusters of eggs at the bases of the leaf-tufts.

These "mother" bugs can be found on the twigs in April, and if examined again in May, each will be found to be surrounded, and partly concealed, by a mass of eggs, the whole embedded in resinous matter, covered with a white powder or down.

As the young hatch out, they pierce the tender leaves and buds, and suck the sap. In their turn they soon lay eggs, and the attack increases, the appearance of winged individuals enabling it to spread from tree to tree. These are all females, capable of laying eggs without the co-operation of the male, but, unlike many of their allies, they do not produce living young, but propagate by eggs only.

Treatment.—This pest is amenable to treatment by any of the "hop-washes" used to clear hop gardens of aphis. Several good washes are in the market, but one can readily be made by mixing 12 lb. of soft soap and a half-gallon of paraffin in 100 gallons of water, taking care to keep the emulsion well stirred during application. Instead of the paraffin, the extract of 8 lb. of quassia may be used.

THE PINE-WEEVIL.—The injury done by this insect is of a very different nature from that of the Larch-bug. The weevil gnaws at the bark of the stems and shoots of the young trees, inflicting wounds from which resin exudes, causing loss of vitality and generally poor condition. It frequently also destroys both leaves and buds by gnawing at their base. It is a large weevil, fully half an inch in length, and its long proboscis is furnished with powerful jaws, capable of working much havoc. It is at work chiefly in June and July.

Treatment.—Something may be done by shaking down the weevils from the trees and destroying them. The pest is best combated, however, by taking advantage of certain weak points in its life-history, which is as follows. In June and July the female beetles seek out weak and dying larch or pine trees, and lay their eggs in cracks in the bark. The young grubs which result burrow "galleries" in the soft tissue beneath the bark, finally changing into pupæ, from which the beetles come forth in the following May. It is therefore clearly feasible to supply the insects with suitable

material in which to lay their eggs, and then to remove and destroy this material and its contained grubs before the time arrives for the emergence of the weevils. The first measure is, therefore, the removal of hopelessly infested trees, fallen trunks, old stocks, &c., which are a standing menace to the plantation, and then traps of pine bark or pine logs are laid early in June, to induce the females to lay their eggs in them. These must, of course, be destroyed some time in the autumn or winter.

MISCELLANEOUS PESTS.

Two cases of attack on apple-trees by the somewhat rare pest, the "Wood leopard-moth" (*Zeuzera æsculi*), were reported from Wiltshire and Gloucestershire. The work of this caterpillar is precisely similar to that of the better known "Goat moth" (*Cossus ligniperda*), and the treatment in the two cases is identical.

Tomatoes in Scilly were attacked during April in a manner hitherto, I believe, unreported in the British Isles. The fruit was gnawed and excavated by caterpillars which were obviously those of Noctua moths, but the one specimen reared was so imperfect as to render identification of the species impossible.

Caterpillars of this group of moths generally work underground, but this was evidently a case of what the Americans call "climbing cut-worms." The large fleshy grubs climbed the plants at night and bit their way into the fruit, within which they fed. This appeared to be a good case for treating in the American way, by baiting for the grubs with cabbage leaves, or even bran, poisoned with Paris green—a plan which presents difficulties in this country in the open, on account of the effects of the poison on game which eat the poisoned grubs. Experience in America has shown that bran mixed with Paris green, three pounds to one sack of bran, is, strangely enough, more attractive to the grubs than their food plant.

Several cases of injury to gooseberries by the sawfly, *Nematus ribesii*, were reported from various localities. This pest can be cleared out with certainty if the plan of removing and deeply burying the surface earth to the depth of three or four inches is thoroughly carried out in the autumn. One member of the Society who has adopted this plan with completely satisfactory results, sifted the surface earth, and was astonished at the number of sawfly pupæ it contained. As the caterpillar, at the close of the attack, goes down to the ground to pupate, it is there at the mercy of the fruit-grower until the following spring, when the fly emerges to lay eggs on the new leaves. During attack, immediate benefit must be sought by hand-picking and soft-soap washings.

It is desirable to call attention to the similarity in appearance between roots infested by the turnip gall weevil (*Ceutorrhynchus sulcicollis*) and those suffering from the disease of Anbury, or "Finger-and-toe." The two attacks are constantly confounded, though the presence of the insect can be immediately detected by opening the "galls" or swellings on the root and observing the legless

white grubs which are feeding within. Care should be taken not to introduce the pest on a farm by planting diseased young roots. Where it has obtained a footing, a dressing of lime is the most effective remedy.

The Hessian Fly was present to a considerable extent in Norfolk during the past season, but its appearance excited very little attention. It seems clear that in ordinary years no great damage is to be feared from this pest in England, though in exceptional seasons it may do considerable harm.

CECIL WARBURTON.

Zoological Laboratory, Cambridge.

ANNUAL REPORT FOR 1899 OF THE CONSULTING BOTANIST.

THE seeds examined during the past year were all remarkably free from impurities. Dodder was found in only one sample of red clover. The germinations were high, though the differences, in several cases, between the highest and the lowest results exhibited a considerable difference in the real value of the seeds. The following table shows the average and the lowest and highest results of the tests in regard to the seeds of the most valuable pasture plants.

Germination of Grasses and Clovers.

—	Average	Lowest	Highest
	Per cent.	Per cent.	Per cent.
Foxtail	66	44	80
Cocksfoot	80	70	88
Rough-stalked meadow grass	76	50	86
Smooth-stalked " "	52	42	61
Timothy	96	92	99
White clover	85	79	97
Red clover	94	79	100
Alsike	95	90	100

It will be seen that as many plants again were produced by the best sample of foxtail as were obtained from the worst sample, though probably the price paid was the same for both ; and in the smooth-stalked meadow grass the better quality produced a third more plants than the inferior quality.

The inquiries dealing with INJURIES TO STOCK believed to be caused by poisonous plants in the pasture have been numerous. Various species of buttercup have been reported upon. All the buttercups have a more or less acrid and irritating juice, and are consequently undesirable weeds in pastures. They are generally avoided by stock, but if eaten in any quantity they would certainly be injurious.

The Upright Buttercup (*Ranunculus acris*, Linn., fig. 1) was abundant in a field of clover in Yorkshire. Ewes and lambs turned into the field began to scour. They were removed and some young horses were put in, and they also began to scour. If these young animals ate this acrid plant, it would fully account for the injury done to them. It is so acrid that even when externally applied to the skin it produces inflammation, blister, and ulceration.

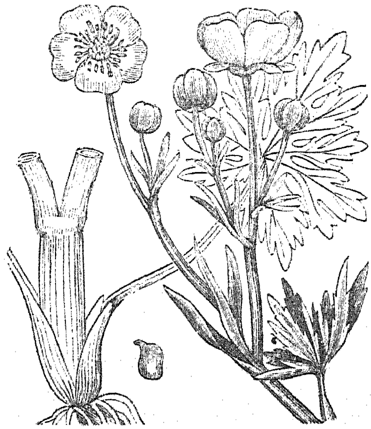


FIG. 1.—Upright Buttercup (*Ranunculus acris*, Linn.)

The Small-flowered Buttercup (*Ranunculus parviflorus*, Linn., fig. 2) appeared in considerable abundance in hay grown in North Lincolnshire, where the plant is fairly common. It has an acrid juice, but the acrid properties disappear when the plant is dried in making hay.

The Pilewort (*Ranunculus Ficaria*, Linn.), a very common weed (fig. 3) in moist meadows in early spring, was suspected of being injurious to cattle. It is less acrid than some of the other

FIG. 2.—Small-flowered Buttercup (*Ranunculus parviflorus*, Linn.)

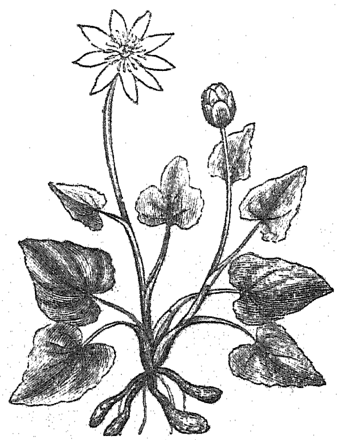


FIG. 3.—Pilewort (*Ranunculus Ficaria*, Linn.)

buttercups, but at the best it is a useless weed which would be better out of the pasture.

The Celandine (*Chelidonium majus*, Linn.) is found on old walls

and banks, under hedges, and in waste places. It is not likely to be eaten by stock, as it does not grow in pastures, unless it was cropped as the stock were passing to their feeding-ground. The whole plant (fig. 4) abounds in a yellowish juice which is very acrid, and would undoubtedly cause irritation in the alimentary canal. Decoctions of the plant are used by herbalists.

The Cuckoo-pint (*Arum maculatum*, Linn.), a native plant (fig. 5) found in woods and hedges, was submitted as probably causing injury to cattle. It has an acrid and pungent juice. Children have been fatally poisoned by eating the fresh plant. It would certainly cause injury to stock if it were eaten, but I have not met with a case in which it was taken by animals, and there is none recorded.

Some calves were reported as having died from poison. They had access to Rhododendron and Laurel, both poisonous plants. The veterinary surgeon believed that death was due to the Rhododendron, and there appears to be good reason for believing that this was so. The species of Rhododendron possess a narcotic poison which produces drowsiness, stupor, and ultimately death. The Laurel (*Laurus nobilis*, Linn.) and the Cherry Laurel (*Prunus Laurocerasus*, Linn.) are dangerous plants, especially the latter.

FIG. 4.—Celandine (*Chelidonium majus*, Linn.)

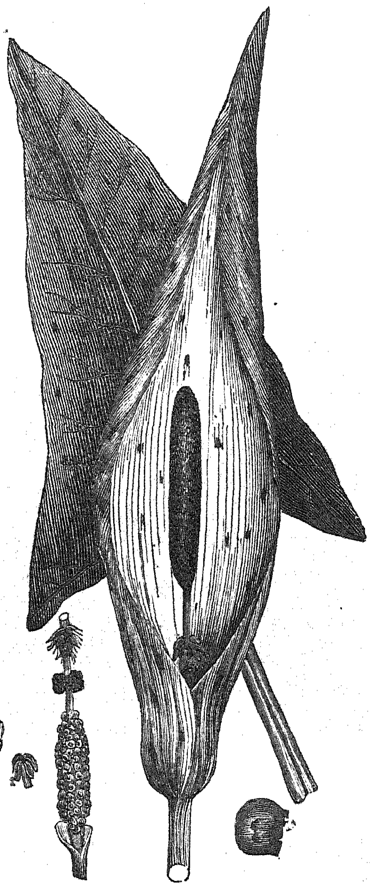


FIG. 5.—Cuckoo-pint (*Arum maculatum*, Linn.)

They both contain an essential oil rich in prussic acid. The symptoms of poisoning by plants containing prussic acid are laboured breathing, a weak pulse, and suffocating convulsions ending in death. The action of the poison has been arrested by the use of artificial respiration accompanied by the injection of atropine, which is an antidote to prussic acid. Any of these shrubs growing near a pasture should be carefully fenced off, and in lopping the shrubs care should be taken to remove the cut portions.

Specimens of the Sweet-scented White Tobacco (*Nicotiana affinis*) were suspected to have been fatal to young cattle. This, like the common tobacco, is a narcotic poison, and should be so enclosed that animals may not obtain access to it.

Some PLANTS THAT ARE INNOCUOUS were submitted under the impression that they had caused injury to stock.

FIG. 6.—Hogweed (*Heracleum Sphondylium*, Linn.)

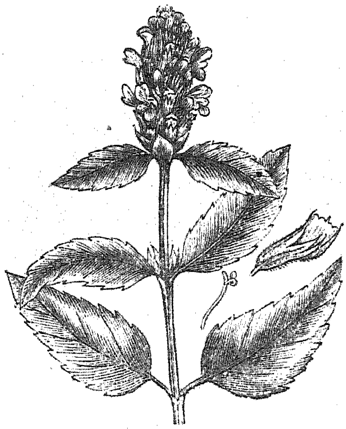


FIG. 7.—Selfheal (*Prunella vulgaris*, Linn.)

Hogweed or Cowkeep (*Heracleum Sphondylium*, Linn.) is a coarse-growing umbelliferous plant (fig. 6) with deeply furrowed angular stems about 4 feet high, large leaves, and numerous white or pinkish flowers in umbels. It came recently under the notice of a member of the Society, who believed it to be a late introduction in his pastures, and he thought it a dangerous plant. It is, however, liked, and freely eaten by cattle and horses. It very seldom flowers in pastures, being eaten down, and is found usually in hay fields or by roadsides or hedges attaining its full size.

Large quantities of Selfheal (*Prunella vulgaris*, Linn.) are found in the fields on a farm in Sussex where some of the sheep were attacked by an illness which could not be accounted for, and it was thought that this plant (fig. 7) might be the cause. But this plant has no injurious characters except that it uselessly occupies ground which should support fodder plants.

Ground Ivy, Hay Maid, or Hedge Maid (*Nepeta Glechoma*, Benth., fig. 8), is a weed generally distributed over Britain, and finding its favourite place under hedges. In the Fen districts it is called "Turn-leaf," and is believed by the farmers to cause abortion in mares if eaten by them when in foal. It is, however, an innocent plant. The fresh leaves have a disagreeable smell and a bitter aromatic taste. It was formerly used for clarifying and flavouring ale. Many virtues were ascribed to Ground Ivy, but it is no longer used, even by the herbalist.

Inquiry was made by a member of the Society as to a disease which appeared amongst cows in Wiltshire and was supposed to be due to the presence in the pasture of some poisonous grasses. There are no grasses possessing poisonous qualities to be found in our pastures. Pasture grasses chiefly differ in some being less palatable

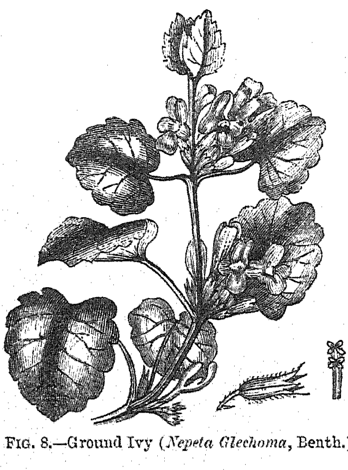


FIG. 8.—Ground Ivy (*Nepeta Glechoma*, Benth.)

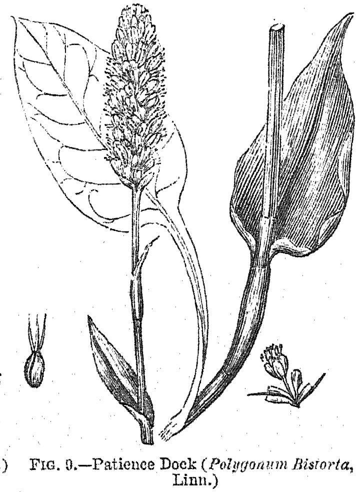


FIG. 9.—Patience Dock (*Polygonum Bistorta*, Linn.)

than others. These grasses are rejected by the stock so long as they are able to obtain other food. Among the grasses most disliked are Twitch or Bent Grass (*Agrostis vulgaris*, Willd.), Fiorin (*Agrostis alba*, Linn.), Yorkshire Fog (*Holcus lanatus*, Linn.), and Brome Grass (*Bromus mollis*, Linn.). These grasses, however, supply nutritious food, if the stock are induced to eat them, but this can be secured only by preventing them having access to any more palatable food.

Other plants which were SUSPECTED TO BE INJURIOUS were determined. Among these were two species of *Polygonum*. Patience Dock or Snake-root (*Polygonum Bistorta*, Linn., fig. 9.) is found in moist meadows and pastures. It is a handsome plant, with many ovate and heart-shaped leaves and a longish head of small pink flowers. It has a tortuous stem creeping a few inches under the surface of the ground, the branches of

which so intertwine among themselves that they drive everything else out of the soil they take possession of. The plant is harmless; indeed, it has been used as a pot herb. The underground stem is astringent, and has so much tannin in its composition that it has been used as a substitute for oak bark. Snake-root is a perennial plant, and cannot be got rid of unless the matted creeping stem is completely dug up and destroyed. The other species has many names, the most common being All-Seed, Knot Grass, and Wire-weed (*Polygonum aviculare*, Linn., fig. 10). It was found in great profusion in a field of clover, and it occurs as a common pest in cultivated ground, and takes possession of bare ground in gardens, waste places, and roadsides. It is not injurious; indeed, when pulled and offered to stock it is eaten. It has a strong root, from which spring many knotted stems spreading on the ground and bearing small

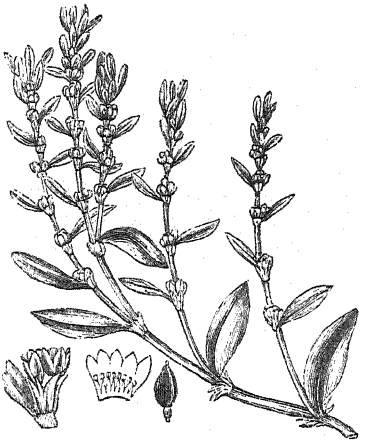


FIG. 10.—All-Seed (*Polygonum aviculare*, Linn.)

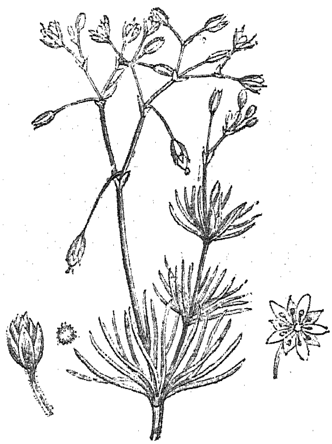


FIG. 11.—Spurry (*Spergula arvensis*, Linn.)

leaves and inconspicuous flowers at the joints. Numerous small brownish-black seeds are produced, which are a favourite food of many small birds. Being an annual, it can be got rid of by hand-pulling, which should be done when the first flowers are fading and the seeds are beginning to form.

Spurry, Doddo or Dodder, Pick-Purse, and Poverty Weed are some of the English names applied to *Spergula arvensis*, Linn. (fig. 11). It is looked upon with great disfavour by cultivators, and deservedly. It is a troublesome weed in corn crops, and sometimes appears as if it were the predominant plant in seeds and clover. The member who forwarded the sample had tried summer fallowing to clear it out of a field without success, and every other effort had been equally futile. If seeds and clover are successfully laid down, the Spurry is crowded out. It is an annual, and consequently if it is prevented from seeding it can be removed, but it produces a large number of

z 2

small dark winged seeds, which, being protected by a hard covering, may remain in the soil for some years without germinating, and if brought to the surface by cultivation would produce a new crop. It is not injurious; indeed, it is grown as an early green crop for sheep and cattle on some poor sandy soils on the Continent.

Red Eyebright (*Bartsia Odontites*, Huds., fig. 12) is larger than the common Eyebright, and instead of the brightly coloured flowers it has flowers of a dull rose colour borne on several leafy spikes. It is not infrequent in somewhat wet meadows and pastures. A cold clay field in Hampshire was laid down for pasture, but the seeds failed, and the land was taken possession of by this plant, which had a vigorous growth. It is an annual plant, and produces a large number of minute whitish ribbed seeds. Hand-pulling would be the most efficient way to get rid of it, if this were done when the first flowers low down the flowering stem are fading and beginning to form seed. Running a machine over the field when the plants are in flower would prevent the ripening of a large proportion of the seeds.

FIG. 12.—Red Eyebright (*Bartsia Odontites*, Huds.)

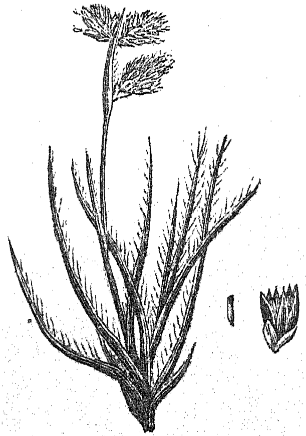


FIG. 13.—Blackcaps (*Luzula campestris*, Willd.)

For some time a considerable portion of the turf upon a field in Warwickshire belonging to a member of the Society has been injured, as it was believed, by poisonous smoke from brick and tile works where glazing is carried on near the field. The bare patches have been taken possession of by the Wood Rush, called Blackcaps or Sweeps (*Luzula campestris*, Willd., fig. 13), a weed which the cattle do not touch. It is a common weed in damp meadows, but has no injurious properties.

A number of cases of INJURY DUE TO PARASITIC FUNGI have been investigated.

From Lincolnshire were sent samples of wheat which yielded a poor crop. They were found to be attacked by two parasitic fungi. The one was *Cladosporium herbarum*, Pers., which attacks the stem, chaff, and fruits. It appears to the eye like a number of minute spots of soot. These consist of a cluster of short stalks, on the top or sides of which are borne the ovoid one- to four-celled spores (conidia). The jointed mycelium enters through a stomate into the tissues of the plant and steals from them the food that is on its way to fill the ear, and, when the attack is serious, it reduces the quality and weight of the yield. The same wheat was attacked also by mould or mildew (*Erysiphe graminis*, D.C.), which has in the past repeatedly done serious mischief to the wheat crop. It penetrates the tissues with its mycelium, and injures the plant in the same way that the Cladosporium does. Spraying with copper sulphate might prevent the germination of the spores of these two fungi. It would be a difficult and costly work to apply the solution; moreover it would require to be done before the injury has been developed, and at a time when it is possible the attack may not be a serious one.

A field of peas in Yorkshire were attacked in the first stages of growth, and within a fortnight of their being sown, with *Pythium debaryanum*, Hesse. This fungus does great damage to seedling plants of different kinds in the garden and the field. It penetrates the tender cells of the young plants in search of the food on which it lives, and it very speedily kills the germinating peas.

The bean crop in several places in Sussex was attacked towards the end of May by *Ascochyta Pisi*, Lib. This fungus attacks the stem, leaves, and pods. It takes away the food, blackens the parts attacked, and prevents them from performing their functions. When the plant is completely blackened it is killed. Happily the time of attack was followed by a period of fine weather, which arrested its progress and saved the greater part of the crop. Attacks of finger-and-toe (*Plasmodiophora Brassicæ*, Wor.) were dealt with in Hampshire and Devon.

Specimens of leaves of plum trees of the Victoria variety were sent from Herefordshire, with the view of obtaining some information as to a serious malady affecting a large number of trees there. The leaves gave no indication of injury to themselves, but they were evidently not performing their proper functions. Portions of the base of the tree and root were forwarded, and on examination these disclosed that the stem was completely killed by a wood-eating fungus. It did not show any external growth, so that it has not been possible yet to determine what the fungus is which is causing the injury. The member who submitted the specimens was asked to keep a look-out for the appearance of fruiting growths outside the diseased trees. He has lately sent specimens of *Stereum sulphureum*, but this is a saprophytic plant, living on dead matter, and it was obviously attacking the branches that had been killed by the fungus that was doing the injury. This disease was believed by a

Herefordshire fruit-grower to be the same as Silver Leaf ; this can be satisfactorily investigated only on the spot.

Leaves of pear trees from Herefordshire growing on a wall with a south aspect were found to be injured by a fungus. The mycelium was everywhere present, but no satisfactory fructification could be detected. It was most probably a species of *Sphæria*, but earlier specimens next year, should it reappear, may help to its identification. The injury was confined to the trees on the wall ; the standard bushes in the same border were not affected. But every leaf on the wall trees was attacked, except one or two young leaves at the top of the trees, and only small, deformed, and worthless fruit was borne by the trees.

A dark covering found on the leaves of orange, chrysanthemum, habrothamnus, and other plants in a conservatory was sent from Herefordshire. This was caused by a minute fungus which was not living parasitically on the leaves, but was epiphytic, finding its food in the "honey-dew" which the green fly or aphis excretes on leaves. The fungus is a species of *Apiosporum*. If the aphis is got rid of, there will remain no nidus on which the fungus can grow ; but it being there and entirely external to the leaf the sooty covering should be wiped off with a cloth or sponge soaked in a solution of copper sulphate. This would kill the fungus in removing, and prevent any threads of mycelium left with portions of the honey-dew from growing.

Some impurities in feeding-stuffs have been determined. A collection of mixed seeds supplied for feeding poultry consisted of the seeds of Corn Bindweed (*Polygonum Convolvulus*, Linn.) 48 per cent., broken and small grains of wheat 44 per cent., Corn Cockle (*Githago segetum*, Desf.) 7 per cent., and seeds of other weeds 1 per cent. The seeds of Corn Cockle are dangerous to fowls, and the use of a mixture containing so large a proportion of these seeds would certainly be so injurious to poultry as to issue in death. The poisonous principle is found in all parts of the plant, but it is more concentrated in the seed. It specially affects poultry, but the continuous use for some time of wheaten flour or meal which has been made from grain containing seeds of Corn Cockle has produced dangerous symptoms in man and quadrupeds. Corn Cockle should be treated as a dangerous weed. It is an annual plant. Seed corn containing its seeds should on no account be sown.

A sample of oats purchased for feeding horses was found to contain a considerable quantity of impurities, and among them seeds of a species of bitter vetch (*Lathyrus*). These seeds have been found to be injurious to man and animals. They contain a narcotic principle which produces paralysis of the limbs, and even death. The mixture was unfit for animal food.

A sample of crushed oats was submitted because of the presence of black husks, the seeds to which they belonged being suspected of causing abortion in five Shire mares. The husks were the covering of the seeds of Corn Bindweed. This is an innocent plant. It could have had nothing to do with the abortion of the mares.

From South Oxfordshire was sent a patch of grass matted together by a whitish growth. This was due to the presence of *Spumaria alba*, D.C., a low organism belonging to the group Mycetozoa, and not far from the fungus causing "finger-and-toe" in turnips. The Mycetozoa consist in their feeding stage of free protoplasm which increases in size as it moves forward amœba-like in search of food. This it encloses in its substance, and when it has appropriated what it can assimilate it pushes out the refuse. In this stage of its life it acts like an animal. But when the plasmodium (or naked protoplasm) has attained maturity, it concentrates itself at certain points and develops sporangia, *i.e.* cases filled with minute spores. In this stage it acts like a plant. The *Spumaria* is not a parasite. In its plasmodium state it may be found on dead leaves, or more frequently on living grass, collected round the stems of the plant or spreading extensively over the neighbouring stems, and binding them together. In this stage it is opaque white. When the sporangia are formed they are covered with a fragile white covering of minute crystals of lime. This white mass, supported on the grass stems, often extends over a space of the pasture a foot in diameter. When the spores are ripe, the white covering is broken up, and the mass appears to be black or dark dull purple from the innumerable dark spores which are exposed, and which gradually float away on the wind. They lie dormant during the winter, and in due time produce the amœba-like plasmodium which has been described. This strange plant-animal has no injurious properties, but its presence is not desirable in a pasture. It should be destroyed by fire on the spot where it grows. If it is carried away, the extremely minute spores will be scattered, and new centres for the development of the organisms multiplied.

A visit was paid at the end of May to Belvoir Castle to investigate the cause of the injury to beech trees there, and similar cases of damaged trees were examined at Harlaxton Manor; the injuries at the latter place were of the same nature but more extensive than at Belvoir Castle.

At both places the trunks of many of the beeches were covered to a large extent with a white woolly aphis, which had been supposed to be the beginning of the fungal attack that was destroying the trees.

The greater number of the injured trees showed dead tracts of bark and wood from eight to twelve inches wide, and running for a long way down the stem of the tree. The bark at these places had begun to crack and fall off. The wood exposed below was hard and dead, and exhibited numerous shallow fissures. It was not injured by fungi. Along the edges of the injured tract the uninjured bark and stem were developing a healthy and vigorous callus, which was gradually covering the dead wood and repairing the injury. This thickening callus was pushing off the dead bark.

In the early stages of the injury, when the bark was killed, water obtained access to the space between the dead bark and the wood. This water gradually found its way through cracks and

small openings in the bark lower down the stem. In oozing slowly out, the water supplied food for the growth of Nostoc and other minute algæ, which formed dark patches on the bark. The injury to the trees was certainly not caused by any living organism—plant or animal; it must have had a physical origin.

There can be little doubt that the injury happened during a severe thunderstorm, the damaged trees being struck by lightning. The electric current as it passed down the stem killed the active tissues between the bark and the wood along the track it followed. The destruction of so large a portion of the living part of the trunk necessarily affected the vigour of the tree. But there is no reason why such trees should not maintain their life, and in time more or less recover from the injury.

A fewer number of trees were being destroyed by a parasitic fungus. The mycelium of the fungus, having got possession of the wood, was penetrating it in every direction and eating it away. Two or three specimens of the fungus were observed which exhibited the beginnings of fructification. From these it was clear that it was a *Polyporus*, most probably *Polyporus fomentarius*, Linn., but the specimens were too young to permit of the species being certainly determined.

When a wood-consuming fungus has produced on the outside of the tree the mass on which the spores are borne, it has got such a hold of the tree that it is not possible to save it; the longer, therefore, the tree is allowed to remain in the ground, the worse it becomes and the more unfit for any economical purpose.

Great care must be taken to prevent the spreading of the evil. The fungus is spread through the forest by the agency of its spores—which are the minute seeds of the fungus, invisible to the naked eye—and these are produced only on the growths which appear outside the tree. These growths should be removed by the forester as soon as they are detected. The knife should be used to clean thoroughly out, cutting a wide margin, and the surface of the wound should be covered with tar. To prevent the scattering of the spores, the fungus after removal should not be left on the ground, or cárried away in the hand or even in a basket, but a bag or sack should be used, and the contents entirely burnt as soon as convenient. These excrescences, of whatever kind they are, and on whatever tree they grow, should on no account be allowed to remain. They cannot be removed too soon. To prevent injury to healthy trees all wounds, accidental or intentional, should be covered with tar. Pruning trees should be done in late autumn or early winter, not only because the trees are then inactive, but because the application of tar to the pruned surface is much more efficient when there is no active flow of sap.

WM. CARRUTHERS.

44 Central Hill, Norwood, S.E.

Notes, Communications, and Reviews.

STATEMENTS OF ACCOUNTS OF SOME FARMS TAKEN IN HAND WHEN THROWN UP BY THE TENANTS.

As an impression is abroad that agriculture is in a hopeless condition, possibly worse than at any other period in history, and as this view of the case is frequently supported by reference to official and other reports, it may not be out of place to bring under the notice of the Royal Agricultural Society of England some statements of accounts showing the financial results of a policy adopted occasionally by owners in accepting the responsibility of themselves taking vacant land in hand.

In fact, the farms in question have all of them at different times within the last ten years been thrown up, leaving with the owner the difficulty, it may be the impossibility, of reletting them to responsible and capable persons, even at a considerable reduction of rent. Anyhow, some of the farms might have been expected to become derelict, while on others matters would have gone on from bad to worse as regards condition, accompanied by a ruinous sacrifice of income.

As the owner was not impecunious, and his adviser or agent not incompetent, the farms were taken in hand where it was obviously unwise to hang back.

The rents have in all instances been fixed at those paid by the outgoing tenants, or according to those paid on the immediately adjoining farms of similar quality.

The knowledge that a landowner is in a position, by the possession of personal skill, energy, and capital, and the command of a standing equipment and staff, to undertake the occupation of such farms as might be thrown up, must obviously strengthen his position should any other of his farms come into the market.

The following statement of accounts will confirm the conclusion some practical agriculturists have come to on the profitable occupation of farms, even in a poor district, at the present day.

The aggregate accounts for the greater portion of these farms, which have been in hand since 1888, show, after deduction for net losses in some of the intervening years, a clear, though not considerable, profit for the term ended Michaelmas 1894.

It might be interesting to give in detail the figures for each year of the struggle out of which the owner emerged, in 1895, on to what appears to be the platform of stability, with a fair expectation, which has hitherto been realised, of a remunerative return for the capital employed : but this would take up too much space in the Journal.

It will be sufficient, therefore, for the purpose of legitimate criticism, if the details of account are set out for the last four years ended Michaelmas 1898.

The farms, it may be added, are not contiguous, but are scattered at wide intervals over the surface of a large district.

ALBERT PELL.

Hazelbeach, Northampton.

STATEMENT OF CERTAIN FARMS IN HAND.

Showing Profit and Loss from Michaelmas 1889 to Michaelmas 1898.

SUMMARY.

1889.	Profit		£1,609
1890.	,,		1,337
1891.	,,		752
1892.	Loss	£625	
1893.	,,	527	
1894.	Profit		482
		£1,152	£4,180
	Deduct Losses		1,152
			£3,028
	Deduct for rent not paid in 1889 *and* 1890		800
			£2,228
	Giving average per annum from 1889 to 1894 of for Interest and Profit.		£371

PURSER'S FARM.

Capital £2,400.
Area 270 Acres.

Dr. Profit *and* Loss Account *for Year ending September* 29, 1895. Cr.

Dr.	£ s. d.	£ s. d.	£ s. d.
To VALUATION, 1894.			
Horses . . .		280 0 0	
Live Stock—			
Cattle . .	320 0 0		
Sheep . .	240 0 0		
Pigs . . .	75 13 0		
Poultry . .	22 10 0		
		658 3 0	
Feeding Stuffs .		26 3 4	
Corn . . .		501 10 0	
Seeds . . .		34 12 0	
Manures . .		5 10 0	
Hay . . .		234 11 6	
Implements . .		200 0 0	
Tillages and Rent of Fallow . .		206 11 8	
Draining . .		172 4 0	
Fixtures . .		20 0 0	
			2,339 5 6
To PURCHASES.			
Horses . . .		3 7 6	
Live Stock—			
Cattle . .	426 12 6		
Sheep . .	73 10 0		
Pigs . . .	3 6 0		
		503 8 6	
Feeding Stuffs .		356 4 10	
Fodder for Horses		166 4 6	
Seeds . . .		87 12 3	
Manures . .		40 2 2	
Hay . . .		0 3 6	
Rent of Farm .	150 0 0		
Rates—Cottages .	23 7 1		
Insurance . .	3 0 0		
Interest . .	1 3 0		
		177 10 1	
Petties, Veterinary . . .		8 17 9	
Implements . .		48 15 4	
Blacksmith . .		10 3 7	
Labour—			
Wages . .	464 2 10		
Coal . . .	5 13 2		
Threshing . .	69 10 0		
Cultivating .	17 16 0		
Fee for Supervision, management, and office work .	136 1 4		
		693 3 4	
Faggots and Stones . .		3 0 0	
			2,098 13 4
Balance for interest and profit . .			268 7 2
			£4,706 6 0

Cr.	£ s. d.	£ s. d.	£ s. d.
By SALES.			
Horses . . .		27 0 0	
Live Stock—			
Cattle . .	859 8 10		
Sheep . .	228 8 11		
Wool . . .	23 3 11		
Pigs . . .	124 2 4		
Poultry . .	70 3 11		
		1,305 7 11	
Feeding Stuffs .		21 5 7	
Fodder for Horses		23 4 0	
Corn . . .		622 8 3	
Hay . . .		285 13 7	
Straw . . .		18 17 1	
Rent of Shooting, &c. . . .		10 0 0	
Implements . .		7 8 3	
Labour . . .		15 14 4	
Faggots and Stones . .		0 5 0	
			2,327 4 0
By VALUATION, 1895.			
Horses . . .		270 0 0	
Live Stock—			
Cattle . .	175 10 0		
Sheep . .	236 5 0		
Pigs . . .	64 13 0		
Poultry . .	20 0 0		
		496 8 0	
Feeding Stuffs .		10 15 0	
Fodder for Horses		4 16 0	
Corn . . .		870 0 0	
Seeds . . .		41 0 0	
Manures . .		5 0 0	
Hay . . .		100 17 0	
Straw . . .		3 0 0	
Implements . .		185 0 0	
Tillages and Rent of Fallow . .		230 6 0	
Draining . .		134 0 0	
Fixtures . .		18 0 0	
			2,369 2 0
			£4,706 6 0

PURSER'S FARM.

Capital £2,450.
Area 270 Acres.

Dr. Profit *and* Loss Account *for Year ending September* 29, 1896. Cr.

Dr.	£ s. d.	£ s. d.	£ s. d.
To VALUATION, 1895.			
Horses		270 0 0	
Live Stock—			
Cattle	175 10 0		
Sheep	236 5 0		
Pigs	64 13 0		
Poultry	20 0 0		
		496 8 0	
Feeding Stuffs		10 15 0	
Fodder		4 16 0	
Corn		870 0 0	
Seeds		41 0 0	
Manure		5 0 0	
Hay		100 17 0	
Straw		3 0 0	
Implements		185 0 0	
Tillages and Rent of Fallow		230 6 0	
Draining		134 0 0	
Fixtures		18 0 0	
			2,369 2 0
To PURCHASES.			
Horses		32 17 6	
Live Stock—			
Cattle	589 16 3		
Sheep	247 11 10		
Pigs	1 2 0		
		838 10 1	
Feeding Stuffs		344 8 2	
Fodder for Horses		141 15 3	
Seeds		63 3 3	
Manure		47 7 2	
Rent of Farm	150 0 0		
Rates	25 11 10		
Fire Insurance	3 0 0		
		178 11 10	
Petties, Veterinary, &c.		12 1 4	
Implements		61 10 10	
Blacksmith		8 17 9	
Labour—			
Wages	493 19 9		
Threshing	88 18 5		
Fee for Supervision	27 2 5		
		610 0 7	
			2,339 3 9
Balance for interest and profit			160 0 8
			£4,868 6 5

Cr.	£ s. d.	£ s. d.	£ s. d.
By SALES.			
Horses		21 8 0	
Live Stock—			
Cattle	744 1 0		
Sheep	349 10 4		
Wool	23 10 3		
Pigs	169 14 1		
Poultry	65 10 8		
		1,352 6 4	
Feeding Stuffs		4 4 3	
Fodder for Horses		13 4 0	
Corn		872 0 8	
Hay		87 9 6	
Straw		36 4 9	
Rent of Shooting, &c.		10 0 0	
Implements		0 13 6	
Labour		50 0 0	
			2,417 11 0
By VALUATION, 1896.			
Horses		290 0 0	
Live Stock—			
Cattle	240 10 0		
Sheep	254 10 0		
Pigs	92 4 0		
Poultry	25 0 0		
		612 4 0	
Feeding Stuffs		20 0 6	
Fodder		4 8 9	
Corn		854 15 0	
Seeds		23 15 0	
Manure		13 10 0	
Hay		67 9 3	
Implements		185 0 0	
Tillages and Rent of Fallow		231 2 11	
Draining		100 10 0	
Fixtures		18 0 0	
			2,420 15 5
			£4,868 6 5

PURSER'S FARM.

Capital £2,450.
Area 270 Acres.

Dr. **Profit** *and* **Loss Account** *for Year ending September 29, 1897.* Cr.

Dr.	£ s. d.	£ s. d.	£ s. d.
To VALUATION 1896.			
Live Stock—			
Cattle . .	240 10 0		
Sheep . .	254 10 0		
Pigs . . .	92 4 0		
Poultry . .	25 0 0		
		612 4 0	
Horses . . .		290 0 0	
Implements . .		185 0 0	
Hay . . .		67 9 3	
Manure . .		13 10 0	
Tillages . .		231 2 11	
Seeds . . .		23 15 0	
Stores . . .		20 0 6	
Fodder . .		4 8 9	
Draining . .		100 10 0	
Fixtures . .		18 0 0	
Corn—	Acres.		
Wheat . .	35		
Barley . .	46		
Winter Oats .	13		
Black Oats .	12		
Beans . .	5		
Clover Seed .	14		
	125		
		854 15 0	
			2,420 15 5
To PURCHASES.			
Horses . . .		3 5 0	
Live Stock—			
Cattle . .	576 15 0		
Sheep . .	31 0 0		
Pigs . . .	1 2 0		
		608 17 0	
Feeding Stuffs .		324 3 1	
Fodder for Horses—			
Oats . . .	89 17 0		
Hay . . .	55 16 6		
		145 13 6	
Seeds . . .		94 10 10	
Manure . .		74 5 7	
Rent of Farm .	150 0 0		
Rates and Taxes .	18 14 10		
Insurance . .	3 0 0		
		171 14 10	
Implements . .	32 12 9		
Blacksmith . .	9 5 3		
		41 18 0	
Veterinary Surgeon . . .	3 8 6		
Postage and Stationery . .	5 10 1		
		8 18 7	
Labour—			
Wages . .	463 17 4		
Threshing .	79 13 3		
Fee for Supervision . .	126 5 9		
		669 16 4	
			2,143 2 9
Balance for interest and profit . . .			261 0 2
			£4,824 18 4

Cr.	£ s. d.	£ s. d.	£ s. d.
By VALUATION, 1897.			
Live Stock—			
Cattle . .	216 0 0		
Sheep . .	246 15 0		
Pigs . . .	96 0 0		
Poultry . .	35 0 0		
		593 15 0	
Horses . . .		281 0 0	
Implements . .		175 0 0	
Hay . . .		70 8 0	
Manure . .		26 10 0	
Tillages . .		230 19 3	
Seeds . . .		27 1 6	
Stores . . .		5 16 9	
Fodder . . .		7 6 0	
Draining . .		90 0 0	
Fixtures . .		18 0 0	
Corn—	Acres.		
Wheat . .	45½		
Barley . .	42½		
Spring Oats .	20		
Winter Oats .	9		
Beans . .	10		
Clover Seed .	11		
	138		
		833 0 0	
			2,358 16 6
By SALES.			
Corn . .		940 0 9	
Horses . . .		51 10 0	
Live Stock—			
Cattle . .	813 10 6		
Sheep . .	186 17 6		
Wool . . .	22 15 0		
Pigs . . .	249 1 1		
Poultry . .	84 11 3		
		1,356 15 4	
Hay		69 7 9	
Straw		38 8 0	
Rent of Shooting .		10 0 0	
			2,466 1 10
			£4,824 18 4

PURSER'S FARM.

Capital £2,450.
Area 270 Acres.

Dr. Profit *and* Loss Account *for Year ending September 29*, 1898. Cr.

Dr.	£ s. d.	£ s. d.	£ s. d.
TO VALUATION, 1897.			
Live Stock—			
Cattle	216 0 0		
Sheep	246 15 0		
Pigs	96 0 0		
Poultry	35 0 0		
		593 15 0	
Horses		281 0 0	
Implements		175 0 0	
Hay		70 8 0	
Manure		26 10 0	
Tillages		230 19 3	
Seeds		27 1 6	
Stores		5 16 9	
Fodder		7 6 0	
Draining		90 0 0	
Fixtures		18 0 0	
Corn—	Acres.		
Wheat	45½		
Barley	42½		
Spring Oats	20		
Winter Oats	9		
Beans	10		
Clover Seed	11		
	138	893 0 0	
			2,358 16 6
TO PURCHASES.			
Horses		84 4 0	
Live Stock—			
Cattle	834 0 0		
Sheep	582 9 0		
Pigs	1 3 0		
		1,417 12 0	
Feeding Stuffs		401 6 10	
Fodder for Horses—			
Oats, &c.	121 7 3		
Hay	47 19 0		
		169 6 3	
Seeds		97 16 6	
Manure		61 16 6	
Rent of Farm	172 10 0		
Rates and Taxes	14 12 4		
Insurance	3 0 0		
		190 2 4	
Implements	70 8 3		
Blacksmith	9 1 8		
		79 9 11	
Veterinary Surgeon	4 4 3		
Postage and Stationery	4 17 6		
		9 1 9	
Labour—			
Wages	468 19 10		
Threshing	92 19 4		
Fees for Supervision — including Management and Office Work	179 17 9		
		741 16 11	
			3,252 13 0
Balance for Interest and Profit			289 18 11
			£5,901 8 5

Cr.	£ s. d.	£ s. d.	£ s. d.
By VALUATION, 1898.			
Live Stock—			
Cattle	221 0 0		
Sheep	222 0 0		
Pigs	135 9 0		
Poultry	27 0 0		
		605 9 0	
Horses		317 0 0	
Implements		200 0 0	
Hay		168 12 6	
Manure		40 10 0	
Tillages		231 5 3	
Seeds		37 5 0	
Stores		22 15 9	
Fodder		5 5 0	
Draining		61 5 0	
Fixtures		18 0 0	
Corn—	Acres.		
Wheat	52		
Barley	46		
Spring Oats	10½		
Winter Oats	7½		
Beans	9		
	125		
		781 4 0	
			2,488 11 6
By SALES.			
Corn		1,055 2 9	
Horses		96 12 0	
Live Stock—			
Cattle	1,036 9 5		
Sheep	762 3 1		
Wool	27 12 0		
Pigs	244 11 11		
Poultry	94 14 0		
		2,165 10 5	
Hay		59 11 9	
Straw		25 0 0	
Rent of Shooting		10 0 0	
Faggots and Stones		1 0 0	
			3,412 16 11
			£5,901 8 5

THE RECTORY FARM.

Capital £4,500.
Area 720 Acres.

Dr. Profit *and* Loss Account *for Year ending September* 29, 1895. Cr.

Dr.	£ s. d.	£ s. d.	£ s. d.
To VALUATION, 1894.			
Horses . . .		285 0 0	
Live Stock—			
Cattle .	1,581 0 0		
Pigs . .	92 15 0		
Poultry .	25 0 0		
		1,698 15 0	
Feeding Stuffs .		73 1 1	
Fodder for Horses		2 5 0	
Corn . . .		1,192 10 0	
Seeds . . .		242 9 0	
Manures . .		54 12 0	
Hay . . .		46 1 3	
Implements . .		370 0 0	
Tillages and Rent of Fallow . .		496 13 0	
Draining . .		21 0 0	
Fixtures . .		46 0 0	
			4,528 6 4
To PURCHASES.			
Horses . . .		95 17 6	
Live Stock—			
Cattle .	2,524 1 6		
Sheep .	806 5 0		
Pigs . .	35 12 0		
		3,365 18 6	
Feeding Stuffs .		510 14 4	
Fodder for Horses		223 17 3	
Seeds . . .		126 16 3	
Manures . .		115 3 5	
Hay . . .		18 7 6	
Straw . . .		0 12 0	
Rent of Farm	400 0 0		
Rent of Cottage .	3 15 0		
Rates . . .	94 4 7		
Insurance . .	4 3 0		
		502 2 7	
Petties, Veterinary . . .		29 17 11	
Implements . .		132 4 6	
Blacksmith . .		17 10 7	
Labour—			
Wages . .	735 16 10		
Coal . . .	3 18 7		
Threshing . .	124 6 10		
Cultivating .	28 0 0		
Fee for Supervision .	133 10 4		
		1,025 12 7	
Interest . .		1 3 0	
Carriage of Milk .		166 4 0	
			6,332 1 11
Balance for Interest and Profit . .			442 0 0
			£11,302 8 3

Cr.	£ s. d.	£ s. d.	£ s. d.
By SALES.			
Horses . .		65 7 0	
Live Stock—			
Cattle . .	2,676 5 2		
Calves . .	91 5 0		
Sheep . .	889 5 8		
Wool . .	35 14 2		
Pigs . .	105 13 0		
Poultry . .	49 1 0		
		,847 4 0	
Feeding Stuffs .		56 1 9	
Fodder for Horses . .		29 4 6	
Corn . . .		1,227 8 3	
Seeds . . .		2 18 6	
Manures . .		6 10 0	
Hay . . .		87 10 6	
Straw . .		0 2 6	
Odd Rents, Feed, &c. . .		108 6 8	
Implements .		45 0 0	
Labour . .		14 8 5	
Faggots and Stones . .		21 16 0	
Milk . . .		1,339 18 2	
			6,851 15 9
By VALUATION, 1895.			
Horses . .		265 0 0	
Live Stock—			
Cattle . .	1,668 15 0		
Pigs . .	97 10 0		
Poultry . .	17 10 0		
		1,783 15 0	
Feeding Stuffs .		16 4 6	
Fodder for Horses . .		3 10 0	
Corn . . .		637 7 6	
Seeds . . .		296 6 9	
Manure . .		84 5 0	
Hay . . .		288 2 11	
Straw . .		70 15 1	
Implements .		350 0 0	
Tillages and Rent of Fallow .		598 5 9	
Draining . .		15 0 0	
Fixtures . .		42 0 0	
			4,450 12 6
			£11,302 8 3

THE RECTORY FARM.

Capital £4,500.
Area 720 Acres.

Dr. Profit *and* Loss Account *for Year ending September* 29, 1896. **Cr.**

Dr.	£ s. d.	£ s. d.	£ s. d.
To VALUATION, 1895.			
Horses . .		265 0 0	
Live Stock—			
Cattle . .	1,668 15 0		
Pigs . .	97 10 0		
Poultry . .	17 10 0		
		1,783 15 0	
Feeding Stuffs .		16 4 6	
Fodder for Horses . .		3 10 0	
Corn . . .		637 7 6	
Seeds . . .		296 6 9	
Manure . .		84 5 0	
Hay . . .		288 2 11	
Straw . .		70 15 1	
Implements .		350 0 0	
Tillages and Rent of Fallow . .		598 5 9	
Draining . .		15 0 0	
Fixtures . .		42 0 0	
			4,450 12 6
To PURCHASES.			
Horses . .		47 5 0	
Live Stock—			
Cattle . .	2,444 1 10		
Calves . .	1 7 0		
Sheep . .	140 5 0		
		2,585 13 10	
Feeding Stuffs .		573 2 11	
Fodder for Horses . .		185 8 0	
Seeds . . .		114 15 1	
Manure . .		88 1 6	
Rent of Farm .	400 0 0		
Rates . . .	99 8 6		
Fire Insurance	4 3 0		
Rent of Cottage	7 15 0		
		511 6 6	
Petties, Veterinary, &c. .		22 9 4	
Implements .		46 12 2	
Blacksmith .		17 9 6	
Labour—			
Wages . .	698 15 3		
Coal . .	10 19 3		
Threshing .	70 5 3		
Cultivating .	25 10 0		
		805 9 9	
Carriage of Milk		161 16 9	
			5,159 10 4
Balance for Interest and Profit . .			160 8 9
			£9,770 11 7

Cr.	£ s. d.	£ s. d.	£ s. d.
By SALES.			
Horses .		42 0 0	
Live Stock—			
Cattle . .	2,569 15 0		
Calves . .	75 2 7		
Sheep . .	296 4 3		
Wool . .	17 9 0		
Pigs . .	102 0 0		
Poultry . .	53 18 2		
		3,114 9 0	
Feeding Stuffs .		5 2 0	
Fodder for Horses		20 0 6	
Corn . . .		562 10 0	
Manure . .		5 0 0	
Hay . . .		137 17 0	
Straw . . .		21 16 3	
Odd Rents and Feed . .		108 6 8	
Implements .		14 5 9	
Labour . .	8 3 0		
Coal . . .	3 0 0		
		11 3 0	
Faggots and Stones . .		8 19 6	
Milk . . .		1,285 3 8	
			5,336 13 4
By VALUATION, 1896.			
Horses . .		245 0 0	
Live Stock—			
Cattle . .	1,857 10 0		
Poultry . .	23 0 0		
		1,880 10 0	
Feeding Stuffs .		29 11 3	
Fodder for Horses		2 8 9	
Corn . . .		792 15 0	
Seeds . . .		408 5 0	
Manure . .		32 0 0	
Hay . . .		158 9 3	
Implements .		315 0 0	
Tillages and Rent of Fallow		516 14 0	
Draining . .		11 5 0	
Fixtures . .		42 0 0	
			4,433 18 3
			£9,770 11 7

THE RECTORY FARM.

Capital £4,500.
Area 720 Acres.

Dr. Profit *and* Loss Account *for Year ending September* 29, 1897. Cr.

Dr.	£ s. d.	£ s. d.	£ s. d.
To VALUATION, 1896.			
Live Stock—			
Cattle . .	1,857 10 0		
Poultry . .	23 0 0		
		1,880 10 0	
Horses . .		245 0 0	
Implements .		315 0 0	
Hay . . .		158 9 3	
Manure . .		32 0 0	
Tillages . .		516 14 0	
Seeds . . .		408 5 0	
Stores . .		29 11 3	
Fodder . .		2 8 9	
Draining . .		11 5 0	
Fixtures . .		42 0 0	
Corn—	Acres.		
Wheat . .	12		
Barley . .	84		
Spring Oats .	25		
Winter Oats .	32		
	153	792 15 0	
			4,433 18 3
To PURCHASES.			
Horses . .		4 5 0	
Live Stock—			
Cattle . .	2,270 11 6		
Sheep . .	872 15 0		
Pigs . .	15 0 0		
		3,158 6 6	
Feeding Stuffs .		670 3 8	
Fodder for Horses—			
Oats . .	99 12 0		
Hay . .	43 15 0		
		143 7 0	
Seeds . . .		78 12 3	
Manure . .		55 19 3	
Hay . . .		3 10 0	
Straw . . .		15 11 6	
Rent of Farm .	400 0 0		
Rent of Cottage .	3 15 0		
Rates and Taxes	78 14 6		
Insurance . .	4 10 0		
		486 19 6	
Implements .	93 9 6		
Blacksmith .	14 11 0		
		108 0 6	
Carriage of Milk		170 8 0	
Veterinary Surgeon . .	15 5 6		
Postage and Stationery . .	7 18 10		
		23 4 4	
Labour—			
Wages . .	669 1 2		
Coal . .	4 8 3		
Threshing .	76 10 4		
Cultivating .	19 0 0		
Fee for Supervision . .	106 14 6		
		875 14 3	
			5,794 1 9
Balance for Interest and Profit . .			411 18 2
			£10,639 18 2

Cr.	£ s. d.	£ s. d.	£ s. d.
By VALUATION, 1887.			
Live Stock—			
Cattle .	1,318 0 0		
Pigs . .	10 0 0		
Poultry . .	19 0 0		
		1,347 0 0	
Horses . . .		250 0 0	
Implements . .		315 0 0	
Hay . . .		237 1 6	
Manure . . .		52 10 0	
Seeds . . .		298 12 0	
Stores . . .		41 7 0	
Tillages . .		458 6 6	
Draining . .		14 17 0	
Fixtures . .		42 0 0	
Corn—	Acres.		
Barley . .	79		
Spring Oats .	18		
Winter Oats .	12		
	109	604 5 0	
			3,660 19 0
By SALES.			
Corn . . .		862 12 6	
Milk . . .		1,283 1 3	
Horses . .		33 0 0	
Live Stock—			
Cattle .	2,973 2 4		
Calves . .	111 15 10		
Sheep . .	904 15 3		
Wool . . .	22 7 8		
Pigs . . .	29 9 0		
Poultry . .	57 18 2		
		4,099 8 3	
Keep, &c. . .		308 2 10	
Seeds refunded by Estate, &c. .		100 15 0	
Hay . . .		181 11 8	
Rent of Shooting, House, &c. .		108 6 8	
Faggots and Stones . .		2 1 0	
			6,978 19 2
			£10,639 18 2

THE RECTORY FARM.

Capital £4,500.
Area 720 Acres.

Dr. Profit *and* Loss Account *for Year ending September 29, 1898.* **Cr.**

	Acres	£ s. d.	£ s. d.	£ s. d.
To VALUATION, 1897.				
Live Stock—				
Cattle . .		1,318 0 0		
Pigs . .		10 0 0		
Poultry . .		19 0 0		
			1,347 0 0	
Horses . .			259 0 0	
Implements .			315 0 0	
Hay . . .			237 1 6	
Manure . .			52 10 0	
Seeds . . .			298 12 0	
Stores . . .			41 7 0	
Tillages . .			458 6 6	
Draining . .			14 17 0	
Fixtures . .			42 0 0	
Corn—	Acres.			
Barley . .	79			
Spring Oats .	18			
Winter Oats .	12			
	109			
			691 5 0	
				3,660 19 0
To PURCHASES.				
Horses . .			175 11 6	
Live Stock—				
Cattle . .		2,599 16 6		
Sheep . .		1,742 3 9		
Pigs . .		19 3 3		
			4,361 3 6	
Feeding Stuffs .			581 3 1	
Fodder for Horses—				
Oats, &c. .		99 0 5		
Hay . .		48 13 0		
			147 13 5	
Seeds . . .			88 11 4	
Manure . .			68 16 0	
Rent of Farm .		460 0 0		
Rent of Cottage		3 15 0		
Rates and Taxes		59 7 9		
Insurance . .		4 10 0		
			527 12 9	
Implements .		94 11 5		
Blacksmith .		5 5 7		
			99 17 0	
Straw . . .			32 10 0	
Veterinary Surgeon . .		15 2 9		
Postage and Stationery . .		9 9 0		
			24 11 9	
Carriage of Milk			178 8 10	
Labour—				
Wages . .		713 14 0		
Coal . .		7 5 6		
Threshing .		56 6 9		
Cultivating .		—		
Fee for Supervision . .		100 8 11		
			877 15 2	
				7,163 14 4
Balance for Interest and Profit . .				318 11 8
				£11,143 5 0

	Acres	£ s. d.	£ s. d.	£ s. d.
By VALUATION, 1898.				
Live Stock—				
Cattle . .		1,563 15 0		
Pigs . .		81 14 0		
Poultry . .		19 0 0		
			1,664 9 0	
Horses . .			113 0 0	
Implements .			234 0 0	
Hay . . .			271 10 6	
Manure . .			22 0 0	
Seeds . . .			115 10 0	
Stores . .			26 16 5	
Fodder . .			1 10 0	
Tillages . .			573 8 1	
Draining . .			7 4 0	
Fixtures . .			42 0 0	
Corn—	Acres.			
Wheat . .	33			
Barley . .	55			
Winter Oats .	24			
	112			
			587 0 0	
				3,817 8 0
By SALES.				
Corn . . .			519 15 0	
Milk . . .			1,389 5 10	
Live Stock—				
Cattle . .		2,537 7 9		
Calves . .		85 18 6		
Sheep . .		1,760 7 3		
Wool . .		103 8 8		
Pigs . .		41 2 4		
Poultry . .		59 8 0		
			4,590 12 6	
Keep, &c. . .			191 11 3	
Grass Seeds refunded by Estate, &c. .			161 5 0	
Hay . . .			319 9 5	
Rent of Shooting, House, &c.			120 0 0	
Faggots and Stones . .			3 18 0	
				7,325 17 0
				£11,143 5 0

ASHPIT FARM.

Capital £2,[illegible]30.
Area 515 Acres.

Dr. Profit *and* Loss Account *for Year ending September* 29, 1895. Cr.

Dr.

	£ s. d.	£ s. d.	£ s. d.
To VALUATION, 1894.			
Horses . .		325 0 0	
Live Stock—			
Cattle . .	263 15 0		
Sheep . .	514 18 6		
Pigs . .	155 15 0		
Poultry . .	17 10 0		
		946 18 6	
Feeding Stuffs .		41 16 0	
Fodder for Horses		21 9 9	
Corn . . .		722 10 0	
Seeds . . .		152 2 6	
Manures . .		16 10 0	
Hay . . .		135 15 0	
Implements .		160 0 0	
Tillages . .		273 2 6	
Draining . .		163 10 0	
Fixtures . .		30 0 0	
			2,988 14 3
To PURCHASES.			
Horses . .		123 12 6	
Live Stock—			
Cattle . .	2,154 9 6		
Sheep . .	1,177 19 3		
Pigs . .	70 10 2		
		3,402 18 11	
Feeding Stuffs .		449 8 7	
Fodder for Horses		267 6 9	
Seeds . . .		224 3 10	
Manures . .		52 15 0	
Hay . . .		128 8 8	
Rent of Farm .	200 0 0		
Rates . . .	41 12 4		
Insurance . .	2 10 0		
		241 2 4	
Petties, V't'rin'ry		15 1 4	
Implements .		117 4 9	
Blacksmith .		22 2 5	
Labour—			
Wages . .	658 6 4		
Coal . .	15 8 8		
Threshing .	141 8 9		
Cultivating .	18 10 0		
Fee for Supervision . .	100 0 0		
		933 13 9	
Faggots and Stones . .		4 4 0	
Interest . .		1 2 11	
Tillages . .		162 3 0	
Draining . .		27 0 0	
Fixtures . .		14 4 0	
			6,189 12 9
Balance for Interest and Profit . .			246 2 6
			£9,424 9 6

Cr.

	£ s. d.	£ s. d.	£ s. d.
By SALES.			
Horses . .		46 5 0	
Live Stock—			
Cattle . .	1,899 13 8		
Sheep . .	1,431 4 11		
Wool . .	39 12 1		
Pigs . .	261 6 1		
Poultry . .	60 17 5		
		3,692 14 2	
Feeding Stuffs .		40 2 9	
Fodder for Horses . .		58 4 0	
Corn . . .		922 10 3	
Manures . .		7 10 0	
Hay . . .		239 14 1	
Rent of Shooting, &c. . .		13 10 0	
Implements .		11 13 9	
Labour . .		25 12 0	
			5,057 16 0
By VALUATION, 1895.			
Horses . .		383 5 0	
Live Stock—			
Cattle . .	1,091 5 0		
Sheep . .	672 15 6		
Pigs . .	17 10 0		
Poultry . .	26 0 0		
		1,807 10 6	
Feeding Stuffs .		21 18 6	
Fodder for Horses . .		10 4 0	
Corn . . .		799 10 0	
Seeds . . .		126 14 6	
Manures . .		61 4 0	
Hay . . .		296 10 0	
Straw . .		47 0 0	
Implements .		225 0 0	
Tillages and Rent of Fallow		367 17 6	
Draining . .		179 19 6	
Fixtures .		40 0 0	
			4,366 13 6
			£9,424 9 6

ASHPIT FARM.

Capital £4,500.
Area 620 Acres.

DR. Profit *and* Loss Account *for Year ending September* 29, 1896. CR.

	£ s. d.	£ s. d.	£ s. d.
To VALUATION, 1895.			
Horses . .		383 5 0	
Live Stock—			
Cattle . .	1,091 5 0		
Sheep . .	672 15 6		
Pigs . .	17 10 0		
Poultry . .	26 0 0		
		1,807 10 6	
Feeding Stuffs .		21 18 6	
Fodder for Horses . .		10 4 0	
Corn . . .		799 10 0	
Seeds . . .		126 14 6	
Manure . .		61 4 0	
Hay . . .		296 10 0	
Straw . .		47 0 0	
Implements .		225 0 0	
Tillages and Rent of Fallow		367 17 6	
Draining . .		179 19 6	
Fixtures . .		40 0 0	
			4,366 13 6
To PURCHASES.			
Horses .		58 0 0	
Live Stock—			
Cattle . .	923 15 9		
Sheep . .	984 18 9		
Pigs . .	28 6 6		
Poultry . .	2 10 0		
		1,939 11 0	
Feeding Stuffs .		714 18 5	
Fodder for Horses . .		300 1 6	
Seeds . . .		254 13 1	
Manure . .		96 17 6	
Hay . . .		61 6 6	
Straw		57 0 0	
Rent of Farm .	270 0 0		
" Cottage	1 15 0		
Rates . .	56 1 9		
Fire Insurance .	3 5 0		
		331 1 9	
Petties . .		16 18 7	
Implements .		153 15 11	
Blacksmith .		31 1 7	
Labour—			
Wages . .	862 7 11		
Coal . .	5 8 9		
Threshing .	120 0 8		
Fee for Supervision . .	125 0 0		
		1,112 17 4	
Tillages . .		190 5 6	
Draining . .		18 18 0	
			5,337 6 8
Balance for Interest and Profit . .			240 8 2
			£9,944 8 4

	£ s. d.	£ s. d.	£ s. d.
By SALES.			
Horses . .		26 16 0	
Live Stock—			
Cattle . .	1,754 16 7		
Sheep . .	827 8 9		
Wool . .	98 0 2		
Pigs . .	22 2 3		
Poultry . .	89 13 11		
		2,792 1 8	
Fodder for Horses		55 10 0	
Corn . . .		980 2 3	
Seeds .		5 5 0	
Hay . . .		431 15 1	
Straw . .		40 6 9	
Odd Rents and Feed . .		50 0 0	
Petties . .		0 15 0	
Implements .		3 6 0	
Labour . .		134 18 3	
Faggots and Stones . .		0 18 0	
			4,521 14 0
By VALUATION, 1896.			
Horses . .		390 0 0	
Live Stock—			
Cattle . .	877 15 0		
Sheep . .	1,105 11 0		
Pigs . .	185 19 6		
Poultry . .	53 10 0		
		2,222 15 6	
Feeding Stuffs .		52 3 9	
Fodder for Horses		25 14 9	
Corn . . .		1,348 10 0	
Seeds . .		109 0 0	
Manure . .		41 0 6	
Hay . . .		428 2 1	
Straw . . .		10 0 0	
Implements .		290 0 0	
Tillages and Rent of Fallow .		360 11 9	
Draining . .		104 16 0	
Fixtures .		40 0 0	
			5,422 14 4
			£9,944 8 4

ASHPIT FARM.

Capital £4,500.
Area 620 Acres.

Dr. PROFIT *and* LOSS ACCOUNT *for Year ending September* 29, 1897. Cr.

Dr.	£ s. d.	£ s. d.	£ s. d.
To VALUATION, 1896.			
Live Stock—			
Cattle . .	877 15 0		
Sheep . .	1,105 11 0		
Pigs . .	185 19 6		
Poultry . .	53 10 0		
		2,222 15 6	
Horses . .		390 0 0	
Implements .		290 0 0	
Hay . . .		428 2 1	
Manure . .		41 0 6	
Straw . .		10 0 0	
Tillages . .		360 11 9	
Seeds . .		109 0 0	
Stores . .		52 3 9	
Fodder . .		25 14 9	
Draining . .		104 16 0	
Fixtures . .		40 0 0	
Corn—	Acres.		
Wheat . .	54		
Barley . .	116		
Spring Oats .	27		
Winter Oats .	23		
Tares . .	1		
Sainfoin .	15		
	236		
		1,348 10 0	
			5,422 14 4
To PURCHASES.			
Horses . .		186 12 6	
Live Stock—			
Cattle . .	864 19 0		
Sheep . .	1,425 8 9		
		2,290 7 9	
Feeding Stuffs .		1,060 12 7	
Fodder for Horses—			
Oats . .	120 19 11		
Hay . .	97 6 0		
		218 5 11	
Seeds . .		126 18 4	
Manures . .		117 5 4	
Straw . .		13 6 0	
Rent of Farm .	270 0 0		
Rates and Taxes	44 12 8		
Insurance . .	3 15 0		
		318 7 8	
Implements .	155 15 11		
Blacksmith .	17 18 4		
		173 14 3	
Veterinary Surgeon . .	26 13 0		
Postage and Stationery . .	6 17 2		
		33 10 2	
Labour—			
Wages . .	711 16 1		
Coal . .	5 15 0		
Threshing .	104 14 0		
Cultivating .	6 1 0		
Fee for Supervision . .	125 0 0		
		953 6 1	
			5,492 6 7
Balance for Interest and Profit . .			497 17 8
			£11,412 18 7

Cr.	£ s. d.	£ s. d.	£ s. d.
By VALUATION, 1897.			
Live Stock—			
Cattle . .	1,108 0 0		
Sheep . .	962 15 0		
Pigs . .	124 6 0		
Poultry . .	45 0 0		
		2,240 1 0	
Horses . .		434 0 0	
Implements .		330 0 0	
Hay . . .		431 9 6	
Manure . .		12 0 0	
Tillages . .		448 1 4	
Seeds . .		35 17 0	
Stores . .		18 16 7	
Fodder . .		3 4 0	
Draining . .		71 9 0	
Fixtures . .		40 0 0	
Corn—	Acres.		
Wheat . .	52½		
Barley . .	63		
Spring Oats .	15		
Winter Oats .	32½		
Beans . .	11		
Clover Seed .	12		
Sainfoin . .	25		
Tares . .	1½		
	212½		
		1,016 5 0	
			5,081 3 5
By SALES.			
Corn . . .		1,480 3 9	
Horses . .		76 8 0	
Live Stock—			
Cattle . .	1,353 4 8		
Sheep . .	2,064 14 7		
Wool . .	97 11 11		
Pigs . .	456 16 10		
Poultry . .	124 12 7		
		4,097 0 7	
Hay . . .		628 2 10	
Rent of Shooting, &c. . .		50 0 0	
			6,331 15 2
			£11,412 18 7

ASHPIT FARM.

Capital £4,500.
Area 620 Acres.

Dr. PROFIT *and* LOSS ACCOUNT *for Year ending September* 29, 1898. Cr.

	£ s. d.	£ s. d.	£ s. d.
To VALUATION, 1897.			
Live Stock—			
Cattle	1,108 0 0		
Sheep	962 15 0		
Pigs	124 6 0		
Poultry	45 0 0		
		2,240 1 0	
Horses		434 0 0	
Implements		330 0 0	
Hay		431 9 6	
		45 0 0	
Manure		12 0 0	
Tillages		448 1 4	
Seeds		35 17 0	
Stores		18 16 7	
Fodder		3 4 0	
Draining		71 9 0	
Fixtures		40 0 0	
Corn—	Acres.		
Wheat	52½		
Barley	63		
Spring Oats	15		
Winter Oats	32½		
Beans	11		
Clover Seed	12		
Sainfoin	25		
Tares	1½		
	212½	1,016 5 0	
			5,126 3 5
To PURCHASES.			
Horses		159 8 0	
Live Stock—			
Cattle	392 10 0		
Sheep	668 12 0		
Pigs	4 1 7		
		1,065 3 7	
Feeding Stuffs		652 19 4	
Fodder for Horses—			
Oats, &c.	186 10 5		
Hay	97 13 0		
		284 3 5	
Seeds		145 8 7	
Manures		105 7 7	
Straw		1 0 0	
Rent of Farm	310 10 0		
Rates and Taxes	30 11 3		
Insurance	3 15 0		
		314 16 3	
Implements	100 11 10		
Blacksmith	14 7 11		
		114 19 9	
Veterinary Surgeon	5 4 2		
Postage and Stationery	5 14 0		
		10 18 2	
Labour—			
Wages	801 1 6		
Coal	16 4 9		
Threshing	101 6 9		
Cultivating	26 0 0		
Fee for Supervision	125 0 0		
		1,069 13 0	
			3,953 17 8
Balance for Interest and Profit			681 6 7
			£9,761 7 8

	£ s. d.	£ s. d.	£ s. d.
By VALUATION, 1898.			
Live Stock—			
Cattle	444 0 0		
Sheep	754 18 0		
Pigs	194 0 0		
Poultry	43 10 0		
		1,436 8 0	
Horses		479 0 0	
Implements		285 0 0	
Hay		651 17 6	
Manure		116 2 6	
Tillages		372 19 6	
Seeds		27 10 0	
Stores		37 16 3	
Fodder		0 17 6	
Draining		38 2 0	
Fixtures		40 0 0	
Corn—	Acres.		
Wheat	58½		
Barley	82½		
Spring Oats	15		
Winter Oats	36		
Beans, Spring	14		
Clover Seeds	12		
Sainfoin	17		
	235	1,093 10 0	
			4,579 3 3
By SALES.			
Corn		1,257 0 6	
Horses		161 10 0	
Live Stock—			
Cattle	1,624 17 6		
Sheep	1,091 10 1		
Wool	38 6 8		
Pigs	290 19 5		
Poultry	127 9 7		
		3,173 3 3	
Hay		545 10 8	
Rent of Shooting, &c.		45 0 0	
			5,182 4 5
			£9,761 7 8

WARREN FARM.

Capital £3,600.
Area 370 Acres.

DR. PROFIT *and* LOSS ACCOUNT *for Year ending September* 29, 1895. CR.

	£ s. d.	£ s. d.	£ s. d.
To VALUATION, 1894.			
Horses . .		310 0 0	
Live Stock—			
Cattle . .	458 0 0		
Sheep . .	867 5 0		
Poultry . .	15 0 0		
		1,340 5 0	
Feeding Stuffs .		22 8 3	
Corn . . .		573 12 6	
Seeds . . .		74 10 0	
Manures . .		7 4 0	
Hay . . .		164 18 6	
Implements .		210 0 0	
Tillages and Rent of Fallow		277 5 4	
Draining . .		36 4 6	
Fixtures . .		4 0 0	
			3,021 8 1
To PURCHASES.			
Horses . .		72 2 6	
Live Stock—			
Cattle . .	1,006 11 6		
Sheep . .	1,478 2 6		
Pigs . .	37 6 0		
		2,522 0 0	
Feeding Stuffs .		402 17 5	
Fodder for Horses		241 5 6	
Seeds . . .		88 8 0	
Manures . .		39 2 5	
Rent of Farm .	250 0 0		
Rates . . .	43 16 11		
Insurance . .	2 0 0		
		295 16 11	
Petties, Veterinary, &c. .		9 13 9	
Implements .		43 7 4	
Blacksmith .		9 3 11	
Labour—			
Wages . .	530 1 9		
Coal . .	9 19 0		
Threshing .	56 17 7		
Cultivating .	45 7 0		
		642 5 4	
Interest . .		1 2 11	
			4,367 6 0
			£7,388 14 1

	£ s. d.	£ s. d.	£ s. d.
By SALES.			
Horses . .		79 3 6	
Live Stock—			
Cattle . .	1,357 3 5		
Sheep . .	1,418 18 5		
Wool . .	160 1 3		
Pigs . .	4 3 3		
Poultry . .	42 10 1		
		2,982 16 5	
Feeding Stuffs .		29 9 9	
Fodder for Horses . .		66 6 0	
Corn . . .		594 15 0	
Seeds . . .		3 8 9	
Manures . .		3 0 0	
Hay . . .		162 15 5	
Odd Rents, Feed, &c. . .		30 13 4	
Implements .		5 12 6	
Labour . .	2 5 0		
Coal . . .	2 11 0		
		4 16 0	
Faggots and Stones . .		35 12 10	
			3,998 9 6
By VALUATION, 1895.			
Horses . .		313 0 0	
Live Stock—			
Cattle . .	412 10 0		
Sheep . .	1,069 10 0		
Pigs . .	76 6 0		
Poultry . .	17 0 0		
		1,575 6 0	
Feeding Stuffs .		31 15 8	
Fodder for Horses . .		4 16 0	
Corn . . .		611 17 6	
Seeds . . .		51 2 6	
Manure . .		37 10 0	
Hay . . .		175 10 3	
Implements .		190 0 0	
Tillages and Rent of Fallow		290 12 9	
Draining . .		27 3 5	
Fixtures . .		4 0 0	
			3,312 14 1
Balance, Loss . . .			77 10 6
			£7,388 14 1

WARREN FARM.

Capital £3,320.
Area 400 Acres.

Dr. Profit *and* Loss Account *for Year ending September 29, 1896.* **Cr.**

Dr.	£ s. d.	£ s. d.	£ s. d.
To VALUATION, 1895.			
Horses		313 0 0	
Live Stock—			
Cattle	412 10 0		
Sheep	1,069 10 0		
Pigs	76 6 0		
Poultry	17 0 0		
		1,575 6 0	
Feeding Stuffs		31 15 8	
Fodder for Horses		4 16 0	
Corn		611 17 6	
Seeds		51 2 6	
Manure		37 10 0	
Hay		175 10 3	
Implements		190 0 0	
Tillages and Rent of Fallow		290 12 9	
Draining		27 3 5	
Fixtures		4 0 0	
			3,312 14 1
To PURCHASES.			
Horses		158 10 0	
Live Stock—			
Cattle	940 9 3		
Sheep	562 13 2		
Pigs	22 2 6		
		1,525 4 11	
Feeding Stuffs		263 12 10	
Fodder for Horses		181 16 0	
Seeds		170 8 4	
Manure		91 4 3	
Straw		11 10 0	
Rent of Farm	280 0 0		
Rates	52 17 8		
Insurance	2 0 0		
		334 17 8	
Petties, Veterinary		8 4 4	
Implements		69 14 9	
Blacksmith		14 15 10	
Labour—			
Wages	617 19 7		
Coal	9 6 0		
Threshing	64 3 2		
Cultivating	7 0 0		
Fee for Supervision	119 10 2		
		817 18 11	
Tillages		96 10 0	
			3,844 7 10
Balance for Interest and Profit			325 8 11
			£7,482 10 10

Cr.	£ s. d.	£ s. d.	£ s. d.
By SALES.			
Horses		29 15 0	
Live Stock—			
Cattle	1,506 19 1		
Sheep	997 13 9		
Wool	89 1 3		
Pigs	89 16 10		
Poultry	38 14 8		
		2,722 5 7	
Feeding Stuffs		26 13 1	
Corn		682 9 3	
Seeds		4 16 0	
Manure		3 10 0	
Hay		100 7 9	
Straw		61 2 3	
Odd Rents and Feed		30 13 4	
Implements		0 5 0	
Faggots and Stones		16 6 0	
Tillages		70 0 0	
			3,748 3 3
By VALUATION, 1896.			
Horses		451 0 0	
Live Stock—			
Cattle	234 15 0		
Sheep	964 10 0		
Pigs	96 2 0		
Poultry	16 0 0		
		1,311 7 0	
Feeding Stuffs		16 7 9	
Fodder for Horses		5 15 6	
Corn		1,033 15 0	
Seeds		54 0 0	
Manure		43 5 0	
Hay		193 6 6	
Implements		190 0 0	
Tillages and Rent of Fallow		411 3 0	
Draining		20 5 10	
Fixtures		4 0 0	
			3,734 7 7
			£7,482 10 10

WARREN FARM.

Capital £5,320.
Area 400 Acres.

Dr. Profit *and* Loss Account *for Year ending September 29*, 1897. Cr.

	£ s. d.	£ s. d.	£ s. d.
To VALUATION, 1896.			
Live Stock—			
Cattle . .	234 15 0		
Sheep . .	964 10 0		
Pigs . .	96 2 0		
Poultry . .	16 0 0		
		1,311 7 0	
Horses . .		451 0 0	
Implements .		190 0 0	
Hay . . .		193 6 6	
Tillages . .		411 5 0	
Seeds . . .		54 0 0	
Stores . . .		16 7 9	
Fodder . .		5 15 6	
Draining . .		20 5 10	
Fixtures . .		4 0 0	
Manure . .		43 5 0	
Corn—	Acres		
Wheat . .	54		
Barley . .	81		
Winter Oats .	15		
Spring Oats .	20		
Bean . .	10		
	180		
		1,033 15 0	
			3,734 7 7
To PURCHASES.			
Horses . .		23 7 6	
Live Stock—			
Cattle . .	1,265 18 6		
Sheep . .	640 13 3		
Pigs . .	10 10 6		
		1,917 2 3	
Feeding Stuffs .		604 12 5	
Fodder for Horses—			
Oats . .	110 11 9		
Hay . . .	52 17 0		
		163 8 9	
Seeds . . .		108 19 5	
Manures . .		46 0 2	
Tillages . .		36 4 0	
Rent of Farm, &c.	280 0 0		
Rates and Taxes	45 13 11		
Insurance . .	2 0 0		
		327 13 11	
Implements .	52 16 6		
Blacksmith .	11 9 6		
		64 6 0	
Veterinary Surgeon . .	7 7 3		
Postage and Stationery . .	4 17 10		
		12 5 1	
Labour—			
Wages .	598 12 8		
Coal . .	3 19 0		
Threshing .	85 4 0		
Cultivating .	8 5 0		
Fee for Supervision . .	77 18 3		
		773 18 11	
			4,077 18 5
Balance for Interest and Profit . .			298 12 6
			£8,110 18 6

	£ s. d.	£ s. d.	£ s. d.
By VALUATION, 1897.			
Live Stock—			
Cattle . .	658 0 0		
Sheep . .	979 0 0		
Pigs . .	39 16 0		
Poultry . .	17 0 0		
		1,693 16 0	
Horses . .		341 0 0	
Implements .		200 0 0	
Hay . . .		209 6 3	
Manure . .		32 10 0	
Tillages . .		260 14 6	
Stores . .		48 17 8	
Fodder . .		9 14 0	
Seeds . . .		57 5 6	
Draining . .		25 0 0	
Fixtures . .		4 0 0	
Corn—	Acres.		
Wheat . .	49		
Barley . .	73		
Winter Oats .	33		
	155		
		939 5 0	
			3,871 8 11
By SALES.			
Corn . . .		1,147 2 0	
Horses . .		182 10 0	
Live Stock—			
Cattle . .	1,293 1 3		
Sheep . .	1,026 7 2		
Wool . .	77 14 7		
Pigs . .	198 10 10		
Poultry . .	42 14 0		
		2,638 7 10	
Hay . . .		211 11 5	
Straw . .		11 10 0	
Rent of Shooting and House, &c.		30 13 4	
Faggots and Stones . .		17 15 0	
			4,239 9 7
			£8,110 18 6

WARREN FARM.

Capital £3,320.
Area 400 Acres.

Dr. Profit *and* Loss Account *for Year ending September 29, 1898.* **Cr.**

Dr.	£ s. d.	£ s. d.	£ s. d.
To VALUATION, 1897.			
Live Stock—			
Cattle . .	658 0 0		
Sheep . .	979 0 0		
Pigs . .	39 16 0		
Poultry . .	17 0 0		
		1,693 16 0	
Horses . .		341 0 0	
Implements .		200 0 0	
Hay . . .		209 6 3	
Manure . .		32 10 0	
Tillages . .		260 14 6	
Stores . .		48 17 8	
Fodder . .		9 14 0	
Seeds . . .		57 5 6	
Draining . .		25 0 0	
Fixtures . .		4 0 0	
orn—	Acres.		
Wheat . .	49		
Barley . .	73		
Winter Oats .	33		
	155		
		989 5 0	
			3,871 8 11
To PURCHASES.			
Horses . .		104 7 6	
Live Stock—			
Cattle . .	1,136 15 6		
Sheep . .	730 7 6		
Pigs . .	15 5 0		
		1,882 8 0	
Feeding Stuffs		586 15 6	
Fodder for Horses—			
Oats, &c. .	107 15 4		
Hay . .	69 6 0		
		177 1 4	
Seeds . . .		122 11 9	
Manures . .		51 14 1	
Rent of Farm, &c.	322 0 0		
Rates and Taxes	29 18 6		
Insurance . .	2 10 0		
		354 8 6	
Implements .	59 11 8		
Blacksmith .	7 16 10		
		67 8 6	
Veterinary Surgeon . . .	5 8 0		
Postage and Stationery . .	4 0 0		
		9 8 0	
Labour—			
Wages . .	612 4 8		
Coal . .	11 3 0		
Threshing .	73 3 10		
Cultivating .	14 5 0		
Fee for Supervision . .	95 3 11		
		806 0 5	
			4,162 3 7
Balance for Interest and Profit . .			278 14 3
			£8,312 6 9

Cr.	£ s. d.	£ s. d.	£ s. d.
By VALUATION, 1898.			
Live Stock—			
Cattle . .	557 0 0		
Sheep . .	998 0 0		
Pigs . .	133 6 0		
Poultry . .	17 0 0		
		1,705 6 0	
Horses . .		277 0 0	
Implements .		200 0 0	
Hay . . .		197 9 0	
Manure . .		8 15 0	
Tillages . .		314 8 3	
Stores . . .		54 2 3	
Fodder . .		3 13 9	
Seeds . . .		40 14 0	
Draining . .		—	
Fixtures . .		4 0 0	
Corn—	Acres.		
Wheat . .	46½		
Barley . .	61		
Winter Oats .	23		
Spring Oats .	13		
Beans . .	5		
Clover Seed .	8		
	156½		
		791 10 0	
			3,626 18 3
By SALES.			
Corn . . .		999 1 6	
Horses . .		236 15 0	
Live Stock—			
Cattle . .	1,673 1 4		
Sheep . .	1,181 17 2		
Wool . .	87 8 8		
Pigs . .	81 4 6		
Poultry . .	34 19 5		
		3,058 11 1	
Hay . . .		265 16 0	
Straw . . .		7 10 0	
Rent of Shooting and House, &c.		36 10 0	
Faggots and Stones . .		13 6 0	
Grass Seeds refunded by Estate . .		29 7 6	
Tillage . .		38 11 5	
			4,685 8 6
			£8,312 6 9

THE LAW OF TRESPASS.

To introduce the subject which it is proposed in this communication to discuss, no words could be more appropriate than those of Sir William Blackstone, the greatest commentator on the laws of England, who writes : [1]

> Trespass in its largest and most extensive sense signifies any transgression or offence against the law of nature, of society, or of the country in which we live, whether it relates to a man's person or his property. But in the limited and confined sense in which we are at present to consider it, it signifies no more than an entry on another man's ground without a lawful authority, and doing some damage, however inconsiderable, to his real property. For the right of *meum* and *tuum*, or property in lands, being once established, it follows as a necessary consequence that this right must be exclusive; that is, that the owner may retain to himself the sole use and occupation of his soil; every entry, therefore, without the owner's leave, and especially if contrary to his express order, is a trespass or transgression. The Roman laws seem to have made a direct prohibition necessary in order to constitute this injury: but the law of England, justly considering that much inconvenience may happen to the owner before he has an opportunity to forbid the entry, has carried the point much farther, and has treated every entry upon another's lands (unless by the owner's leave, or in some very particular cases) as an injury or wrong, for satisfaction of which an action of trespass will lie, but determines the *quantum* of that satisfaction by considering how far the offence was wilful or inadvertent, and by estimating the value of the actual damage sustained.

The particular form of trespass to the consideration whereof our attention is confined is that which the law knows as trespass *quare clausum fregit*, that is *by breaking his close*, so called because every man's land is in the eye of the law inclosed and set apart from his neighbours, and that either by a visible and material fence, as when one field is divided from another by a hedge, or by an ideal invisible boundary existing only in contemplation of law, as when one man's land adjoins another's in the same field.[2]

Trespass, then, for our present purpose, may be tersely defined as "an unwarrantable entry on another's soil." But it is not every unauthorised entry that can properly be described as unwarrantable, for in some cases the trespass is justifiable, or rather entry on another's land or house shall not in those cases be accounted trespass at all; as if a man comes thither to demand or pay money there payable, or to execute in a legal manner the process of the law. Also a man may justify entering into an inn or public-house without the leave of the owner first specially asked, because when a man professes the keeping of such inn or public-house, he thereby gives a general license to any person to enter his doors. So a landlord may justify entering to distrain for rent,[3] and the entry will

[1] 3 Bl. 208. [2] 3 Bl. 209. [3] 3 Bl. 212.

also be excused if it can be shown that it was committed in self-defence in order to escape from some pressing danger or apprehended peril, or in defence of the possession of a man's goods and chattels, or cattle, sheep, or domestic animals; for "if I drive my beasts along the highway, and my beasts enter your land and eat the herbage thereof, and I come freshly and chase them out of your land, you shall not have any action against me, because the chasing them was lawful. So if my goods have been taken by you, and placed on your land, I may justify my entry on your land for the purpose of retaking them."[1]

Again, if the trespass, although not legally justifiable, is not of an insulting or wilful and persevering nature, and no actual damage has been done, and no question of title is involved, the damages recoverable will probably be merely nominal, whilst on the other hand if the entry is made after notice or warning not to trespass, or is a wilful and impertinent intrusion upon a man's domestic privacy, or an insulting invasion of his proprietary rights, a very serious cause of action will arise, and exemplary damages may be awarded. So that although the offence of trespass does not (as under the Roman law) depend upon a previous warning or notice having been given, yet a wilful disregard of such a prohibition will aggravate the injury, and may influence the extent to which the remedy will be applied.

Where a trespass has been committed the remedy which is applicable in all cases is by action in the High Court or County Court for the recovery of damages, and claiming, in proper cases, an injunction restraining the repetition of the offence. This, however, is at best an expensive process, and where the trespasser is a person of no means, and unable to pay any damages or costs, the so-called remedy is practically illusory.

In cases, therefore, where the trespass is wilful and malicious, the law has attempted to provide an alternative procedure by summary prosecution under the Malicious Damage[2] Act 1861, which is generally supposed to be designed to meet the many small but annoying trespasses to which farmers and others are too often subjected. Whether the object of the Act has been fully attained is a question which can only be answered by those who were responsible for its enactment, but, whatever may have been the intention of its framers, it is certain that the Act in its practical operation falls far short of preventing unwarrantable entries upon the farmer's lands, and fails to supply a convenient method of dealing with those by whom his privacy is invaded.

It will suffice for us to consider two sections only, viz. the 24th and the 52nd. The 24th section enacts that whosoever shall unlawfully and maliciously destroy, or damage with intent to destroy, any cultivated root or plant used for the food of man or beast, or for medicine, or for distilling, or for dyeing, or for or in the course

[1] Catesby, arg. 6 Ed. 4, 7 pl. 18. Goodwyn *v.* Cheveley, 4 H. & N. 631.
[2] 24 & 25 Vict. c. 97.

of any manufacture, and growing in any land, open or enclosed, not being a garden, orchard, or nursery ground, shall be liable for a first offence to one month's hard labour or a fine not exceeding 20*s.* and to pay the damage and costs, or six months for a second offence. The 52nd section provides that whosoever shall wilfully or maliciously commit any damage, injury, or spoil to or upon any real or personal property whatsoever, either of a public or private nature, for which no specific punishment is provided by the Act, may be sent to prison with hard labour for two months, or be ordered to pay a fine not exceeding 5*l.*, together with the damages and costs. Other sections of the Act deal with injuries to cattle, fences, trees, and garden produce, but no difficulty usually arises in regard to these, so we need not pause to discuss them.

It will be noticed that these sections do not apply to involuntary trespasses; the offence must be wilfully or maliciously committed, and there must be some damage done. The word "maliciously" must however be understood as meaning "purposely" as distinguished from "in ignorance" or "by accident." There must be a wilful and intentional doing of an unlawful act in respect of the property damaged without lawful excuse. As to intention, the general principle is that where a man commits an unlawful act unaccompanied by any circumstances justifying its commission, it is a presumption of law that he acted advisedly, and with intent to produce the consequences which have ensued. No man can shelter himself from punishment on the ground that the mischief he committed was wider in its consequences than he originally intended. And as to malice, if the act be done wilfully or wantonly it will be presumed to have been done maliciously: it is not necessary that the offender should be actuated by any ill-will conceived against the owner of the property.

To explain and illustrate the law as construed by the courts, take the case of a farmer near a town, many of whose inhabitants not only loved to ramble in the country lanes and breathe the refreshing air, but showed a decided partiality for the farm in question, which with its pretty walks and shady dells, topped by breezy hills commanding extensive views and clothed in verdant pastures on their slopes, not only attracted romantic lovers, but formed an ideal spot for picnics and provided a happy hunting-ground for naturalists, botanists, and other collectors, to wit, the gatherers of mushrooms, blackberries, and other fruits of the earth. Imagine the farmer to be one of the long-suffering type—glad to see others enjoying themselves so long as they did no harm. He bore with the picnic parties and depredations of fern roots, primroses, mushrooms, and blackberries till his patience was sorely tried, and he even submitted to the public making tracks across his fields and leaving the gates open as a temptation to his stock to get mixed, or to damage his crops. But when some enterprising youths began to make his pasture into a football ground he felt bound to make a stand. His first step therefore was the erection of a frowning board announcing to all whom it might concern that "trespassers

will be prosecuted." Strange to say, however, instead of being regarded as an example of British fairplay on the part of a man who did not wish to take his adversary unawares, it was jeered at by some, whilst others roundly abused the poor farmer for what the local press condemned as his "dog in the manger policy." More exasperated than ever, the sturdy agriculturist determined to carry out his threat and to prosecute one and all who invaded his domain. With what success would he be likely to meet?

The first case which should be noticed is one that arose at Newcastle-on-Tyne, 1881,[1] which goes to show that in order to bring an offence within the Act there must be damage to property of some kind, and not merely an interference with a right. It seems that the good people of Newcastle-on-Tyne had been smitten with a very prevalent fever for the classic game of bowls, and for the purpose of a green they utilised a convenient plot of ground upon the Town Moor. Now the Corporation of Newcastle-on-Tyne are the owners of the soil of the Town Moor, but the same is subject to a right of herbage or pasture for two milch cows respectively in the resident freemen or free burgesses of the said borough. The public have free access to the Town Moor, and an unrestricted right of walking or riding on the same. A committee of stewards and wardens regulated and protected the rights of the freemen over the Moor. The committee considered that it was desirable to stop the playing of games on the Moor, as although the public had a right to walk or ride about the Moor they had no right to wear away the turf by playing games to the prejudice of the freemen. They therefore prosecuted one of the bowlers, and charged him with doing wilful damage to the grass and herbage to the extent of one penny. But it was argued that the committee were not the proper persons to institute the proceedings, as all they had was a right or benefit of herbage, which was neither real nor personal property. The magistrates took this view, and their decision dismissing the summons was upheld on appeal, the court holding that the Act applied only to property of a real, tangible, and visible nature, which was capable of being wilfully injured by trespassers, and not to everything which comes within the description of a mere legal right.

The next is a football case, arising under the following circumstances:[2] Oliver Eley was charged in 1885 with unlawfully and maliciously damaging with intent to destroy certain grass for the food of beasts at Ashbourne in Derbyshire, thereby doing injury to the amount of one penny. On the preceding Ash Wednesday Oliver and some other men had entered a park, through which a footroad ran. They left the footpath and played football on the grass some distance from the path, in spite of express notice not to do so, and defiantly remained there after being asked to leave. It was formerly the annual practice in Ashbourne to play football on

[1] Laws *v.* Eltringham. 51 L.J., M.C. 13; 46 J.P. 230.
[2] Eley *v.* Little, 50 J.P. 309.

Shrove Tuesday and Ash Wednesday in each year, beginning in the market-place and playing in and through the streets of the town. The former custom was for the football to be always turned up in the market-place at the Bull Ring, and any one who liked, whether an inhabitant or not, could join in the game, and could please himself upon which side he would play. The two sides were called "Upwards" and "Downwards," and the football was played by kicking, throwing, or carrying the ball without any literal or other limit, either as to the course or route through the town, or whether along the stream of a river, along the public roads, or over hedges, and across private gardens and enclosed fields, and to one or other of the two goals, which were respectively Sturston Mill for the "Upwards" goal and Clifton Mill for the "Downwards" goal, each of the said mills being distant about a mile and a quarter from the market-place. The ball, however, had not been turned up in the market-place for many years, in consequence of the custom having been held to be illegal. In the course of the game the ball was frequently, but not always, taken into the park and into and across a large fish-pond there. In later years the football had by permission been annually turned down or thrown up in a field called Shaw Croft, and on the day in question it was kicked off by being thrown into a crowd of several hundred persons assembled there. In the struggle between the contending masses the ball was kicked into the highway and was several times driven over the hedge into the park, and was as often thrown back by men employed for that purpose by the owner of the park. About the same time a large number of spectators entered the park to watch the match, but, with the exception of some half-dozen men (including the defendant), they prudently kept to the footpath, inasmuch as a number of large notices were conspicuously displayed warning them of the consequences if they presumed to digress. The defendant, however, in the ardour of his enthusiasm, not only ignored these threatening intimations, but persistently disregarded the repeated requests of the park-keepers that he would be kind enough to move away. The result was that he was summoned under the Malicious Damage Act to appear and account for his misdeeds, which he failed to do to the satisfaction of the justices, who very naturally held that he had acted wilfully and persistently and defiantly, and must have intended the direct consequence of his deliberate acts, namely, damage, injury, or spoil, to the amount of one penny. They therefore convicted him, and ordered him to pay the damage, with a small fine and costs.

But the defendant vowed he would never pay the fine unless bidden to do so by a higher court. The decision therefore came under review in the Queen's Bench Division, before Justices Day and A. L. Smith. In the defendant's behalf it was submitted that treading upon grass did not come within the class of injuries for which there was a summary remedy under the Act. On the other hand, it was contended that it was a case of wilful trespass after express notice, and that there must have been some grass kicked up in the course of playing the game, and that that was evidence of damage. To

this Mr. Justice Day replied that "you might as well say that walking on the seashore was injury to the sand, as suggest that playing football in the month of February would damage the grass;" and proceeded to hold that the conviction was utterly wrong, as there was no intent to destroy grass in any shape or form. His lordship admitted that a trespass had undoubtedly been committed, but he held that the Act did not apply to mere acts of trespass, and that no damage had been shown to be done, or at least that it was wholly inappreciable. And Mr. Justice A. L. Smith concurred, being of opinion that even if there were actual damage it must be proved to have been done wilfully, that is, with the purpose of doing the damage. But that purpose was entirely negatived, for all that happened was that the man was playing football, and had gone into the park to keep up the game. To hold that treading on grass in such circumstances was wilfully doing damage would be straining the law.

No doubt if an action had been commenced in the County Court nominal damages would have been awarded, and an injunction might have been obtained, which would effectually have prevented the defendant from trespassing in future. But it does not follow that the damages (if awarded) would have been paid; and probably the heavy costs would have had to be borne by the aggrieved landowner. And an injunction restraining one man would not be likely to have much terror for the rest of the inhabitants, who could have continued to observe Ash Wednesday in their accustomed manner until they were themselves restrained. Possibly a few bulls or wild cattle of uncertain temper turned into the park would be a more effective remedy. It would be interesting to know whether the ancient customs of Ashbourne still survive; and if not, what were the measures which suppressed them.

There is a story that one of Her Majesty's judges, of a benevolent disposition, placarded his estate with notices that "trespassers will not be prosecuted," thus intimating to the toiling public that they were at liberty to seek rest and change in the cool sequestered vales of his sylvan retreat. An unkind cynic, however, has suggested that his lordship's legends were a satire on the decision we have just been discussing, and that the boards would more appropriately have read "trespassers cannot be prosecuted."

Another judge is reputed to have remarked that wherever he saw a notice against trespassers he deemed it a fair presumption that there was a right of way, and that he should not hesitate to go wheresoever he pleased, as the criminal law did not apply to trespass, and if his presence were objected to he should tender a shilling, which would more than cover any damage he had done, and so meet any contemplated civil procedure by being able to plead tender before action brought.

One of the most annoying forms of trespass to which the farmer is subjected is that committed by mushroom gatherers, who not only systematically range the pastures, often accompanied by a "likely" looking lurcher on the alert for anything that may come to the net,

but actually carry off the fruits of the earth and make a handsome profit out of the plunder. Putting aside the cumbrous and practically useless remedy provided by the civil courts, a difficult question arises as to how the criminal law may be cheaply and expeditiously applied to protect agriculturists against these marauders; and it is no easy problem that confronts us. Mushrooms in their natural state are a spontaneous product of the soil; they savour of the realty and form part of the freehold; they are therefore not the subject of larceny; their severance and taking away amounts at common law to trespass only. The Larceny Act provides[1] that whosoever shall steal any plant, root, fruit, or vegetable production growing in a garden, orchard, pleasure ground, nursery, hot-house, green-house, or conservatory shall be liable to fine and imprisonment on summary conviction. This, however, does not help us, as it does not apply to plants or fruit growing in a field. Again, another section[2] of the Act provides a penalty for any person stealing any cultivated root or plant used for the food of man or beast. But mushrooms growing wild in a field are not *cultivated* plants or roots, and therefore this section, also, has no application. It is perfectly clear that the mere gathering and taking away of wild mushrooms is not stealing, either by statute or at common law.

Attempts have in consequence been made to bring offenders within the Malicious Damage Act, but so far with very little success. As in the Larceny Act, so in the Malicious Damage Act, the sections relating to cultivated plants and the products of gardens cannot apply. Accordingly some ingenious persons have sought to bring the case within the section relating to trespass on real property, and as it is no offence to gather and appropriate the mushrooms, the aggrieved farmer has endeavoured to suppress the evil by prosecuting offenders for wilfully or maliciously damaging his grass. Like Portia, who told Shylock that he was welcome to the pound of flesh to which the bond entitled him so long as he took no drop of blood, the farmer cheerfully bids the trespasser take the mushrooms if he will, provided he takes care not to walk upon the grass!

But we have already seen that in order to justify the infliction of a fine for trespass some actual damage to real property must be proved. This is the whole gist of the offence. In one case the justices refused to convict, as no appreciable damage was proved, and on appeal to the Queen's Bench it was held that the decision was right;[3] but in other instances the justices have found as a fact that actual damage to a small amount, such as 6*d.* or 1*s.*, has been committed, and on the strength of this finding convictions have been obtained.[4]

And the law as to mushroom gathering applies equally to entries on land for the purpose of taking wild plants of any kind, such as

---

[1] 24 & 25 Vict. c. 96, s. 36. [2] Sect. 37.
[3] Gardner *v.* Mansbridge (19 Q.B.D. 217; 51 J.P. 442, 612 Treat.).
[4] R. *v.* J. J. Hexham, *The Times*, March 14, 1887.

digging up fern roots, plucking blackberries, and the like, though there is one recorded case of a man being sent to prison for picking primroses in a wood. At least, this was the substantial complaint against him; but as this constitutes no offence in law the justices probably resorted to some fiction, such as positive damage to herbage, for the purpose of bringing him within the Act.

In order to surmount the difficulty in the case of mushrooms, it is sometimes suggested that the occupier of the land should apply manure or salt for the purpose of stimulating the growth of mushrooms, and so bringing them within the category of cultivated plants. But it is at least doubtful whether this expedient would be effective, for the application of a stimulant to a natural product of the soil growing wild could hardly amount to bringing that product into a state of cultivation. If, on the other hand, some spawn were actually planted by the occupier, he might fairly be said to be cultivating mushrooms, and so claim to bring his case within the section which prescribes a punishment for persons unlawfully and maliciously destroying, or damaging with intent to destroy, any cultivated root or plant used for the food of man; but, even so, it might be plausibly argued that the destruction of the mushrooms was the last thing which the pilferer desired to effect, and the more appropriate remedy would probably be that provided by the Larceny Act in regard to cultivated plants.

It may, however, be said that it is not at all unusual to read of convictions for the analogous offence of cutting holly and other evergreens. True, but the Act specifically provides [1] for damage to trees, saplings, shrubs, or underwood, if amounting to 1*s.* at the least, and if the damage be less than 1*s.* the section against injuries to property in general will apply. A rather singular illustration occurred at Devonport in 1887.[2] Sir William Hamilton was charged with damaging a chestnut tree growing on Mr. Bone's lawn to the extent of 11*d.* The tree overhung the high road, on the opposite side of which were Sir William's gardens. It seems that boys were in the habit of throwing stones at the chestnut blossoms, with the result that the stones fell into Sir William's gardens and broke his glass. To remedy this, that gentleman armed himself with a ladder and a pole twenty feet long with a hook at the end and proceeded to knock the blossoms off the tree. The next scene was laid in the police-court, where Sir William was called upon to justify his conduct, and, failing to do so to the satisfaction of the bench, he was convicted and ordered to pay damages, fine, and costs. He appealed to the High Court, and his counsel contended that it was obviously absurd to treat the incident as a criminal offence, that it was at most a trifling trespass which did not come within the Act any more than the gathering of mushrooms or the trampling of grass in playing football. But the judges held that the conviction was clearly right. There could be no doubt that the damage done to the tree was wilful, and the fact that the damage was

[1] 24 & 25 Vict. c. 97, s. 22.

[2] Hamilton *v.* Bone, 52 J.P. 726.

trifling was no defence. Mr. Justice Field distinguished the case from the football trespass, and remarked: "It must not be hastily assumed, because the damage was small here, that the case does not come within the 52nd section. That section is most appropriate to meet such a case as this, for it is obvious it would have been preposterous for the respondent to sue the appellant in the County Court for the damage committed. If that section were not applied to cases like this, it would have the effect of altogether modifying the intention of the legislature as expressed in that section."

A little knowledge is, however, a dangerous thing, as a trespasser recently discovered to his cost. A gentleman who seems to have prided himself more on his knowledge of law than on his respect for the privacy of his neighbours, went for a stroll along the banks of a river. By way of variety he tried a short cut across a field in which there were some cattle, but where the grass in places was up to his knees, and very thick and deep. On the way he passed two notice-boards with the words "No Road" upon them. The tenant of the field met him and told him he had no right there, and received the reply: 'I am doing no harm. I know the law of trespass as well as you. I shall not turn back; if you wait here half an hour you will see me come back. I shall continue to cross as often as I like." This walking monument of the law then continued on his way, and did damage to the amount of sixpence. The irate farmer, resenting what he doubtless considered to be unwarrantable conduct, promptly summoned the aggressive intruder before the local bench, and had the satisfaction of hearing the defendant ordered to pay damage, fine, and costs, probably much to that gentleman's disgust and to his no little surprise.

But the defendant, who boasted that he knew the law so well, vowed that he would soon get those benighted justices put right, and hastened to lay his treatment before the Queen's Bench. There he contended through his counsel that the remedy was a civil and not a criminal one; that in order to justify a conviction it was necessary that there should be an intention to do damage; here there was no such intention, but merely a desire to take a short cut. The farmer did not take the trouble to appear on the appeal, so there was no argument in support of the conviction. But the Court nevertheless held that the justices were right.[1] Mr. Justice Day (one of the judges who decided the football case) thought that the facts justified the magistrates in holding that there was wilful and malicious injury, and, moreover, they had their own knowledge of the locality to help them in estimating the effect of such a trespass upon the grass in question. They had found as a fact that the grass was long and thick, and that it was trespassed upon and trodden down for a distance of 130 yards by the appellant, and that he did some actual damage for which 6*d.* was a reasonable compensation. It was perfectly clear therefore that some damage had in fact been done, and a man who did damage in that way must be

[1] Gayford *v.* Chouler, 67 L.J., Q.B. 404; 62 J.P. 165.

taken to have intended the natural consequences of his act. It seemed idle therefore to say that the damage was not intentional; if intentional, it was wilful in the ordinary acceptation of the term. The appellant therefore had wilfully and maliciously committed an injury within the meaning of the section, and the justices had jurisdiction to convict. And so that enterprising exponent of the law left the court a wiser man, with the satisfaction of having enriched his store of learning on the subject by yet another decision on the point.

At first blush, this decision of Mr. Justice Day appears to be in direct conflict with his ruling in the football case 12 years earlier. But it is distinguishable, by reason of material damage having been done to the grass, whereas in the earlier case it was held that there was no evidence of any damage at all, or at all events the damage was wholly inappreciable, having been laid at one penny only.

Therefore the question whether the criminal law provides a remedy for small trespasses or not seems to depend upon the answer to the question, Has any real actual damage been done to the land? The amount of damage which will justify a conviction is probably a matter upon which justices must exercise their discretion, though it is difficult to say where they should draw the line, as apparently sixpennyworth of damage is sufficient to support a conviction, whilst one pennyworth is not.

Justices, however, in their anxiety to make the law effective, must be careful not to strain it: they have but to administer the law, they cannot make it. The law may be defective, but it is for the legislature, not for the justices, to supply the defect. To find 6*d.* damage simply for the purpose of giving themselves jurisdiction is undoubtedly improper. To put the point bluntly, justices in so doing determine as a fact that which they know is not a fact in order that they may be able to convict a defendant who could not otherwise be convicted. In order, therefore, to justify a conviction, actual damage should be strictly proved; it cannot be assumed.

Curiously enough, the words in which Chief Justice Best described the law under the Petty Trespass Act in 1827 appear to exactly express the result of the decisions on the enactment in force to-day. He said: [1] "An Act of Parliament which puts the liberty of a subject in danger ought to receive a strict construction, and I think it is not every walking over another man's land for recreation, if no damage is done, that constitutes a case within the meaning of this Act. You must make out actual positive damage; imaginary damage will not do. There is imaginary damage in every walking over grass-land, and for this you may bring your action, if you are sufficiently ill-natured; but you cannot proceeed under this Act of Parliament. I do not think the party has committed an offence within the meaning of this Act. It is improper and vexatious, in fields in the neighbourhood of a road, to be subject to this kind of

---

[1] Butler *v.* Turley, 2 C. & P. 585; 31 R.R. 701.

conduct; but until it is proved that there has been actual damage it is not within the Act."

Having dwelt so long upon the discussion of trespass on the surface of the soil, it may be refreshing to glance for a moment at trespass in another form. It is a maxim of the law that to whomsoever the soil belongs, it is his as far as the Heavens and to the Lower Regions. This not only prevents a man undermining his neighbour's land and stealing his minerals, but enables the occupier to insist on the removal of overhanging boughs of trees and other projections. And it also has this effect, that not only is it a trespass to enter on land, but it is also technically a trespass to cross over property even at an elevation. Therefore a landowner can prevent telephone wires crossing his land if he wish to do so; and strictly speaking aeronauts sailing through space in a balloon are trespassing from one field to another as they go along. Of course they are not criminally liable, as they do no damage: and probably a civil action would be regarded as frivolous and result disastrously for the plaintiff in the matter of costs, unless he had any real ground of complaint, such as that he had been blinded by sand thrown from the balloon. But it is one of the inconsistencies of human nature that the very men who complain most bitterly if any one walks across their close-cropped pasture receive with open arms and do homage to any balloonist who pays them the compliment of alighting in their fields, and damaging fence after fence and dragging up roots in his efforts to strike a firm anchorage. In this way real and substantial damage is often done, but the farmer is proud of the marks, and, regarding his visitors as descending from above, he entertains them hospitably, and feels that the glamour of their glory is reflected on his home.

The black-letter lawyers laid it down that by the common law and custom of England the poor were allowed to enter and glean upon another's ground after harvest, without being guilty of trespass, which humane provision seemed to be borrowed from the Mosaic law, and that in like manner the common law warranted the hunting of ravenous beasts of prey, as badgers and foxes, in another man's land, because the destroying of such creatures was said to be profitable to the public.[1] Both these dicta, however, have been long since exploded.

The passages in the Mosaic law which were supposed under the Christian dispensation to support the right to glean are the following: "And when ye reap the harvest of your land, thou shalt not wholly reap the corners of thy field, neither shalt thou gather the gleanings of thy harvest, and thou shalt not glean thy vineyard, neither shalt thou gather every grape of thy vineyard; thou shalt leave them for the poor and stranger," Lev. xix. 9, 10. Again: "And when ye reap the harvest of your land thou shalt not make clean riddance of the corners of thy field when thou reapest, neither shalt thou gather any gleaning of thy harvest: thou shalt leave

---

[1] 3 Bl. 212, 13.

them unto the poor and to the stranger," Lev. xxiii. 22. Also: "When thou cuttest down thine harvest in thy field and hast forgot a sheaf, thou shalt not go again to fetch it: it shall be for the stranger, the fatherless, and the widow," Deut. xxiv. 19.

The claim was however disposed of once for all in a case [1] which came before the court more than one hundred years ago. An action was brought for a trespass committed by a woman who entered a field, treading down grass and corn, and taking and carrying away barley in the straw. It was attempted to justify the trespass on the ground that the premises had been sown with barley, and the crop lately reaped, and carried off the land; and that the defendant being an inhabitant legally settled in the parish, and being a poor, necessitous, and indigent person, had entered the land for the purpose of gleaning and gathering the straw containing ears of barley remaining and being dispersed and scattered abroad in the said close. The case was twice argued, but the court finally held that no person has at common law a right to glean in the harvest field, neither have the poor of a parish (as such) any such right. Lord Loughborough delivered a judgment which is so interesting that no apology is needed for setting it out *in extenso*. He said:

> When the claim of a right to glean was first brought before the court, it was laid indefinitely to be in poor, necessitous, and indigent persons. I was then of opinion against the claim:—
>
> 1. I thought it inconsistent with the nature of property which imports exclusive enjoyment.
>
> 2. Destructive of the peace and good order of society, and amounting to a general vagrancy.
>
> 3. Incapable of enjoyment, since nothing which is not inexhaustible, like a perennial stream, can be capable of universal promiscuous enjoyment.
>
> This right is now claimed by poor persons legally settled; but in this form also it is equally liable to objection. There can be no right of this sort enjoyed in common, except where there is no cultivation, or where that right is supported by joint labour; but here neither of those criteria will apply. The farmer is the sole cultivator of the land, and the gleaners gather each for himself, without any regard either to joint labour or public advantage. If this custom were part of the realm, it would prevail in every part of the kingdom, and be of general and uniform practice; but in some districts it is wholly unknown, and in others variously modified and enjoyed.
>
> Although the division of parishes is of very high antiquity, yet a right to a maintenance by settlement was first introduced by the statute of the 43 of Eliz. In ancient times tithes were divided into three parts; the first for the maintenance of religion, the second for the church, and the third for the poor; but the third division was a matter of charity rather than of right. When by the second Lateran Council in the 12th century tithes were appropriated to particular parishes, they were not considered as making in any part a provision for the poor which might be claimed as a right. Although the law of Moses has been cited for a foundation for this claim, the political institutions of the Jews cannot be obligatory on us, since even under the Christian dispensation the relief of the poor is not a legal obligation, but a religious duty.

[1] Steel *v.* Houghton, 1 H.Bl. 51, 2 R.R. 715.

The authority in our law upon which the right to glean is supported is a dictum of Sir Matthew Hale in (Duncombe's) "Trials per pais," but though I entertain the highest respect for the authority and character of that great judge, yet it would be doing injustice to his memory to take every hasty expression of his at *nisi prius* as a serious and deliberate opinion. In truth, that dictum imports no more than that the question could not be raised without being put upon the record.

The consequences which would arise from this custom being established as a right would be injurious to the poor themselves. Their sustenance can only arise from the surplus of productive industry; whatever is a charge on industry is a very improvident diminution of the fund for that sustenance; for the profits of the farmer being lessened, he would be less able to contribute his share to the rates of the parish; and thus the poor, from the exercise of this supposed right in the autumn, would be liable to starve in the spring.

It may perhaps be useful to know that gleaning is exercised merely on sufferance, and cannot be insisted upon as a right. But the subject is becoming year by year of less importance, as, owing to improved machinery and the exercise of greater economy on the part of the farmers, there seems to be less and less to glean, so much so that the writer once heard it seriously suggested that the agricultural depression ought to be regarded as a visitation provoked by the greed of those who take the rakings as well as the sheaves and leave so little on the ground to replenish the gleaner's store.

Again, the attempt to justify entry on land for the purpose of hunting ravenous beasts of prey has met with the same inglorious fate. It was held [1] in 1786 that a person might justify trespass in following a fox with hounds over the grounds of another if that were the only means of killing the fox. This decision seems to have been based on the ground that the fox was destructive and hurtful vermin, and that hunting was the only ways and means of killing it. In a later case,[2] however, it was held that such trespasses were not justifiable when the pursuit was for pleasure and amusement, and an action [3] tried in 1879 set all doubt at rest. A farmer who was working in his field forbade some gentlemen who were hunting to cross his land. One of them insisted upon riding into the field, and the farmer turned the horse back. Some of the gentlemen then assaulted him, for which they were summoned and convicted. On appeal the conviction was upheld, and, discussing whether the trespass could be justified because the fox is a noxious animal and its destruction is for the public good, Lord Coleridge showed that although possibly correct in the days when this was laid down, it could not be considered sound law at the present time, when the fox is most carefully preserved, and its destruction by any other means than that of hunting regarded in the country as a crime. It is abundantly evident that the object of hunting, as carried on now, is

[1] Gundry *v.* Feltham, 1 T.R. 334.
[2] Earl of Essex *v.* Capel, 1 Popham, 162.
[3] Paul *v.* Summerhayes, 48 L.J., M.C. 33.

not the destruction of vermin for the public good, but the amusement and pleasure of the hunters. This being so, it is clear that the farmer was quite within his rights in forbidding the gentlemen to come upon his land.

And masters of foxhounds should note a serious liability which may be imposed upon them by the misdeeds of the field. Apparently the master is answerable not only for his own acts, but also for the conduct of those whom he brings together, Lord Tenterden having held [1] that if a gentleman sends out his hounds and his servants and invites other gentlemen to hunt with him, although he does not himself go on the lands of another, but those other gentlemen do, he is answerable for the trespass that they may commit in so doing, unless he distinctly desires them not to go on those lands: if he does not so desire them he is answerable in point of law for the damage that they do.[2]

It is just as well that hunting men should understand that they are allowed to follow their sport by the good will of farmers, who, so long as the sport is conducted reasonably, will no doubt be always ready to welcome the M.F.H. and his pack, and be the first to acknowledge that the good derived in various ways by agriculturists from hunting far outbalances the harm.

There are other forms of trespass, such as those committed on railways or in pursuit of game, but the limits of this paper have already been stretched, and, even if time and space allowed, those are the subjects of bye-laws and special enactments, and do not fall within the provisions of the general law, with which alone it has been attempted to deal.

A. E. Bromehead Soulby.

Malton, Yorks.

WEATHER INFLUENCES ON FARM AND GARDEN CROPS.[3]

There are few sciences so intimately connected one with the other as Meteorology, Agriculture, and Horticulture. Indeed so dependent is plant life upon atmospheric conditions that it has been found, at the Experimental Farm at Rothamsted, that the difference between good and bad seasons is that double the produce can be grown in a good season as compared with what can be raised in a bad one, even when all the necessary ingredients of plant food have been supplied to the soil. By all engaged in either agricultural or horticultural pursuits this fact is so fully realised that the probable effect of prevailing or coming weather upon their crops is seldom

---

[1] Baker v. Berkeley, 3 C. & P. 32.

[2] See also Hume & Oldacre, 1 Stark N.P.C. 351; Hill *v.* Walker, 2 Peake's Add. Cases, 234; Robinson *v.* Naughton, 8 C. & P. 252.

[3] Presidential address by Edward Mawley, F.R.H.S. From the *Quarterly Journal of the Royal Meteorological Society*, vol. xxiv.

absent from their minds. The connection is so intimate that, given detailed weather records for any year, it would be almost possible in many cases to trace the effect of the seasons upon different kinds of produce throughout the whole period, and even to make an approximate estimate as to the ultimate yield of each. In one of the Rothamsted reports the question of the close connection between meteorology and agriculture is thus referred to: "As only about 5 per cent. of the total wheat crop (the nitrogen and ash constituents) is derived from the soil itself, the remainder coming directly or indirectly from the atmosphere, and as the amount of matter accumulated from either source depends mainly on the quantity and the relations to one another of heat and moisture, we cannot be surprised that the character of the seasons exercises such a preponderating influence on the growth of our crops."

Climate of the British Isles.

It has been said that "climate beats culture." This being to a great extent true, it becomes necessary to consider, before treating of the effects of different types of British weather upon British crops, the general character of our own climate. We have only to look at an isothermal chart of the northern hemisphere in order to see that the general features of our climate do not depend so much on latitude as upon the unique position of these islands, situated as they are between a wide ocean on one side, and the largest continent in the world on the other. Were they dependent for temperature upon latitude alone, they would probably be as cold and infertile as Labrador. It is rather our situation in respect to the warm waters of the Atlantic, and the abundant moisture brought by the prevailing winds which blow across it, which provide us with such a mild and equable climate as compared with other places no farther north than ourselves. The changes in weather are remarkably frequent, but owing to our moist atmosphere and cloudy skies, and the causes just mentioned, there is a marked absence of extremes of any kind. This freedom from extremes allows of a great variety of plants being grown with success, and no doubt accounts for the fact that probably a larger number of indigenous species are to be found in Great Britain than in any other country in the world of an equal extent.

Even within the limited area of the British Isles there are varieties of climate and soil sufficiently marked to considerably influence our selection of crops and methods of culture. Take almost any ordinary farmer from a northern to a southern county, or from the south-west of England to the eastern counties, and he will for some years be at a loss how to adapt his previous experiences to his new surroundings. The maps of mean minimum temperature in January and mean maximum temperature in July, which appeared recently in Messrs. Scott and Gaster's paper[1] on the

[1] *Quarterly Journal of the Royal Meteorological Society*, vol. xxiii. p. 275.

temperatures of the British Isles, and which are reprinted here (figs. 1 and 2), will show how great are the differences in temperature at these the coldest and warmest periods of the year in various parts of the country. To take extreme instances. On an average January night the coast station on the extreme south-west of Cornwall will be seen to be 10° warmer than that situated in the coldest part of the midlands; whereas during the hottest part

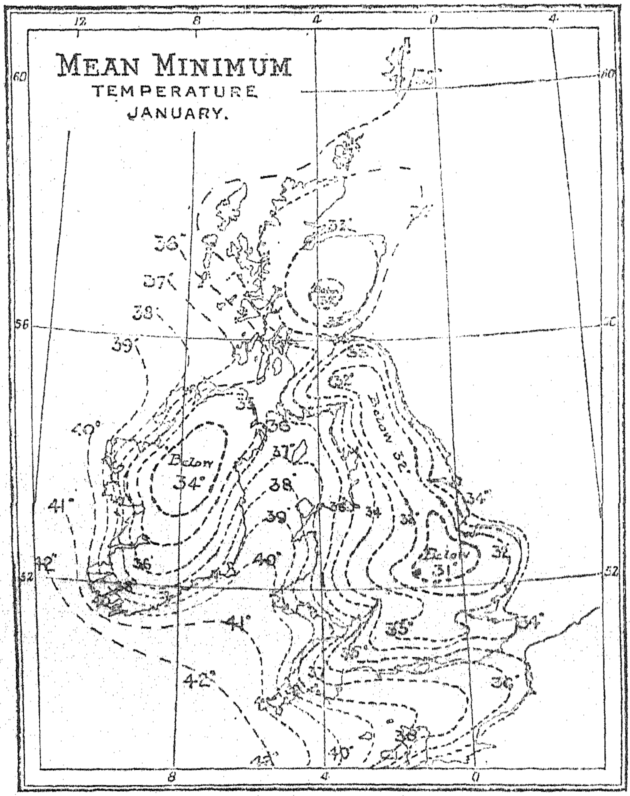


FIG. 1.

of a July day, the warmest localities in the midlands and eastern counties are at this season 10° warmer than many places in the north of Scotland. In the paper to which I refer, a correction has been applied for the height of the stations above sea-level; otherwise the lines of equal temperature would come out with much less regular curves, and would show in the hilly districts marked differences within comparatively short distances.

The distribution of rain over the British Isles is so irregular that it is not easy in a few words to describe it. There are, however, certain main features which, on looking at a rainfall map, are at once observable. For instance it will readily be seen by the deeper shading that the average rainfall is heavier in Ireland than in England, and heavier still in Scotland. Then again, there is a more or less gradual decrease from west to east, the heaviest falls

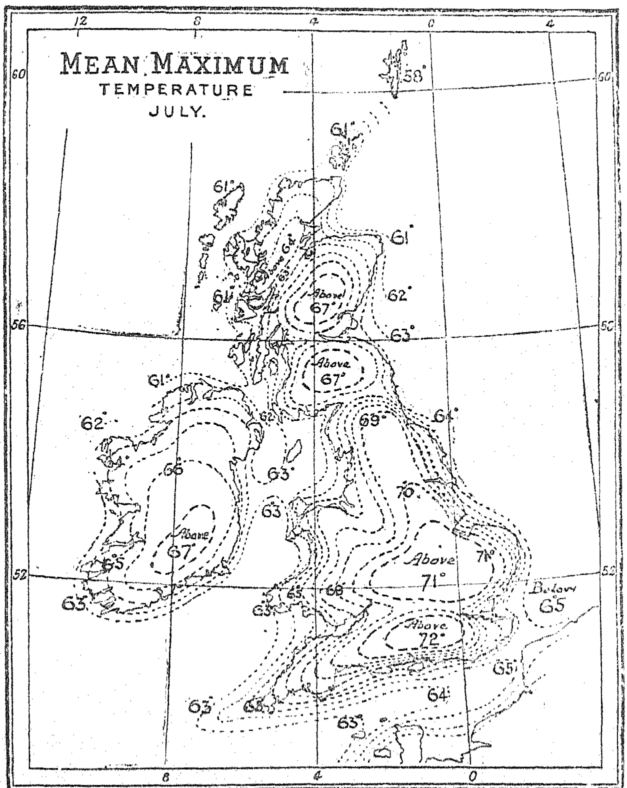


FIG. 2.

of all occurring, as a rule, where the hills are highest on the western side, while the driest localities are situated at low levels in the eastern counties.

The questions of sunshine and wind will be dealt with a little later on under their respective headings. There is, however, one characteristic feature of our climate which I have only space to mention here, and that is the large amount of moisture present, as a rule, in the air. This humid condition of the atmosphere is, of

course, due to our insular position, our cloudy skies and frequent rainfall. Its effect on plant life, generally, is very great, and on the whole beneficial, and accounts for the remarkable verdure of a British landscape as compared with that of most other countries.

No doubt the reason why the question of the influences of weather changes upon cultivated plants has been so seldom dealt with has arisen from the difficulty of separating the individual effects of heat, light, and moisture upon the various crops from their combined effects upon them. Besides which, most farm and garden plants vary a good deal in the time of year when they are in most active growth, the length of time they remain on the land, and the range and character of their roots. Nevertheless, it is a question of considerable importance and deserving of further investigation, seeing how dependent all cultivated plants are upon atmospheric conditions, and how all weather changes of any importance, be they favourable or unfavourable, leave their mark for a shorter or longer period on each crop.

Having given a slight sketch of the chief characteristics of the climate of the British Isles as a whole, we may now proceed to consider separately some of the effects produced on vegetation in this country by varying temperatures, by scanty and heavy rains, by sunshine and by wind; and afterwards treat of the leading farm and garden crops and their special requirements with regard to atmospheric conditions.

TEMPERATURE.

Of all the influences brought to bear on vegetable life by the atmosphere that of temperature is the most powerful and far-reaching. Not only are plants affected by changes of temperature above ground, but its influence upon their roots is in most cases even more clearly to be traced. The fact is, each kind of plant and each function of its growth has its own particular requirements, as regards day and night temperatures, during its growing period, so that if these temperatures be exceeded or fallen short of, it does not thrive as well—too great warmth over-stimulating its growth, and too little checking it. Of course the wider the departure from these special temperatures the more will its growth be injuriously affected. Then again, a certain degree of warmth must be maintained for a sufficient length of time to allow of any plant coming to maturity. For instance, maize can be grown as a fodder crop in this country, but it seldom, if ever, perfects its seed, owing to the shortness of our summers. If we trace the distribution of indigenous species of this and other countries, we shall find that each advances as far, and only as far, into higher latitudes or into elevated regions as it finds the amount of heat required to complete its growth and ripen its seed. From this we learn how important it is that the cultivation of those farm crops alone, which from experience have been found best adapted to our soil and climate, should be attempted. Of course in gardens, where extra care and attention can be given

to each kind of plant, this caution may be to a great extent neglected.

As a rule, a reasonable amount of heat is best suited in this country to the majority of our farm and garden products. That is to say, a gradual rise in temperature from the middle of January to the middle of July, and as steady a decline until the coldest period is again reached, would best meet their requirements. But, unfortunately, we can seldom count upon such favourable conditions being maintained for more than a few weeks at a time, the general tendency being at any season towards too great or too little warmth. Most of our field crops, with the exception of clovers and grasses, are annuals; whereas most of the plants grown in the garden, excepting the kitchen garden, are perennials, which require rest at some period of the year, and this, with few exceptions, they obtain during the winter months. Knowing, as we do, how the atmosphere receives its warmth, not only from the direct influence of the sun, but from the heat it obtains from the ground, it will be readily understood how greatly the surface soil, particularly uncropped soil, becomes heated above that of the air. It is, however, not only the surface soil which becomes heated, for the warmth thus obtained descends to a considerable depth in the ground. So that the subsoil in this way becomes a storehouse of heat for plants to draw upon during the comparatively sunless period of the year; while it likewise serves by its lower temperature to keep their roots from becoming unduly stimulated during the summer months.

At 1 foot deep a *clay* soil—taking the year as a whole—is rather colder than the air; a *sandy* soil decidedly warmer, while a *chalk* soil is generally about the same temperature as the air. At 4 feet deep the ground is in all three cases cooler than the air during the period when most plants are in active growth (April–August), and warmer during the remaining seven months. These differences are greatest with a chalk soil; less with a clay soil; and least with a sandy soil. In fact, the soil last named is at 4 feet deep but little cooler than the air throughout a great part of the five warm months above mentioned, although decidedly warmer during the rest of the year. The greater the depth below the surface the more slowly are the changes above ground felt. For instance, taking 1 foot deep as representing the soil and 4 feet deep the subsoil, the former, like the air, is warmest in July; whereas at the depth of 4 feet the warmest month is August. Again, Mr. Symons has shown that at 1 foot deep the ground is coldest, as a rule, not during the night, but at 9 a.m., and warmest, not at midday, but at 9 p.m., whereas at 4 feet deep the changes take place so gradually that there is no appreciable difference at any hour. It was found by Dr. Buchan, when discussing the temperatures of light and heavy soils, "that light soils are subject to a greater degree of frost near the surface than strong clay soils, but that frosts do not penetrate so far down into light soils as into strong clay soils, the explanation being that light loose soils are worse conductors of heat than strong, clayey, compact soils."

Investigations on the Continent appear to have shown that the rate of progress made by any crop is governed in a great measure by the duration or rather accumulation of temperature above or below the point at which active growth begins and is maintained. This critical point varies with different plants, but the Meteorological Office in its publications has adopted 42° as a sufficiently close approximation for most farm crops in these latitudes, and employs the method devised by Sir R. Strachey, by means of which the variations from this base are determined. Following the nomenclature adopted in the case of the "foot-pound," Gen. Strachey introduced the term "day-degree," by which is signified the continuance throughout 24 hours of an excess or defect of one degree from this base temperature of 42°. The calculations are made as follows. Suppose the minimum temperature of the air on any day to be 50°, the maximum 70°, the mean 60°. Since the temperature never fell so low as 42°, it is clear that it must have been effective as regards growth throughout the entire day; and since the mean for the 24 hours was 60°, it is also obvious that, if the base temperature of 42° be deducted from that value, the difference + 18° will represent the accumulated amount of this effective temperature. On the other hand, had the readings throughout the day been below the base temperature, the difference between the mean and 42° would show a defect of so many day-degrees. In cases in which the temperature varies on both sides of the base the accumulated value is obtained by using a small factor.

Table I., kindly placed at my disposal by Sir Henry Gilbert, will give a very good idea as to how far such accumulated temperatures may be relied upon to furnish approximately correct results in this country. Those given in the lower part of the table are derived from the mean of the Meteorological Office estimates of daily excess at all the stations in England East and in the Midland Counties. In the first column the calculations date, as in the *Weekly Weather Reports*, from January 1; in the second from February 1; in the third from March 1; in the fourth from April 1; in the fifth from the period when the crop appears above ground; and in the sixth from the same period, but omitting those days which are too cold to allow of any progress being made. It will be noticed that, however calculated, the difference between the least and the greatest amount of accumulated heat required at Rothamsted in any year to complete the growth of wheat and ripen the grain, was in all cases about 300°, or about one-sixth of the total mean value for the 18 years. This appears to me a very large range indeed, and shows that such calculations can only be regarded as rough approximations, at all events as far as the leading cereal crop in this country is concerned.

Frost.

As farmers and gardeners invariably speak of temperatures below 32° as so many degrees of frost, and as such low readings have often

TABLE I.—*The Wheat Crop and Accumulated Temperatures. Aggregate Excess of Daily Mean Temperature above 42° F. (or 5°·55 C.) from Fixed Dates, or from Commencement of Active Above-ground Growth to Date of Harvest at Rothamsted.*

YEARS	Fahrenheit Degrees.						Centigrade Degrees.					
	From Jan. 1	From Feb. 1	From Mar. 1	From Apr. 1	From period of active growth	From period of active growth after a check	From Jan. 1	From Feb. 1	From Mar. 1	From Apr. 1	From period of active growth	From period of active growth after a check
According to Records of Monthly Mean Temperature at Greenwich.												
27 years, 1852–78, Max.	2183	2183	2183	2183			1213	1213	1213	1213		
27 years, 1852–78, Min.	1864	1845	1845	1808			1036	1025	1025	1004		
27 years, 1852–78, Mean for 27 yrs.	2023	2018	2004	1981			1124	1121	1113	1100		
According to Records of Daily Mean Temperature at Greenwich.												
6 years, 1871–76, Max.	2285	2259	2181	2123			1269	1255	1212	1179		
6 years, 1871–76, Min.	2064	2015	1985	1875			1147	1120	1103	1042		
6 years, 1871–76, Mean for 6 yrs.	2189	2143	2098	2008			1216	1190	1166	1116		
According to Meteorological Office Estimates of Daily Excess.												
1878	1999	1950	1864	1768	1999	1950	1111	1083	1036	982	1111	1083
1879	1990	1990	1962	1881	1990	1961	1106	1106	1090	1045	1106	1089
1880	1995	1976	1899	1744	1976	1976	1108	1098	1055	969	1098	1098
1881	1816	1814	1804	1699	1814	1804	1009	1008	1002	944	1008	1002
1882	2018	1968	1891	1703	2026	1966	1121	1093	1051	946	1126	1092
1883	1790	1743	1665	1628	1772	1645	994	968	925	904	984	914
1884	1847	1757	1687	1561	1847	1686	1026	976	937	867	1026	937
1885	1774	1752	1674	1601	1774	1696	986	973	930	889	986	942
1886	1924	1915	1915	1816	1915	1915	1069	1064	1064	1009	1064	1064
1887	1816	1789	1736	1679	1812	1729	1009	994	964	933	1007	961
1888	1862	1834	1824	1790	1862	1799	1034	1019	1013	994	1034	999
1889	2016	2000	1977	1882	2013	1977	1120	1111	1098	1046	1118	1098
1890	1947	1853	1842	1715	1947	1842	1082	1029	1023	953	1082	1023
1891	1834	1808	1744	1676	1834	1706	1019	1004	969	931	1019	948
1892	1875	1847	1807	1749	1871	1807	1042	1026	1004	972	1039	1004
1893	2028	2007	1952	1728	2028	1964	1127	1115	1084	960	1127	1091
1894	1934	1890	1819	1645	1932	1838	1073	1050	1011	914	1073	1021
1895	1716	1716	1716	1607	1716	1716	953	953	953	893	953	953
Maximum . .	2028	2007	1977	1882	2028	1977	1127	1115	1098	1046	1127	1098
Minimum . .	1716	1716	1665	1561	1716	1645	953	953	925	867	953	914
Mean for 18 years .	1899	1867	1821	1715	1896	1832	1055	1037	1012	953	1053	1018

a distinct influence on plant life, I have thought it well to devote a few paragraphs specially to their consideration.

In the first place, there are many kinds and degrees of frost, each of which has a different effect on plants which are not perfectly

hardy. For instance, there is the moderate frost of short duration, which as a rule acts beneficially, by giving a wholesome check to growth during a dangerous period of the year. There is the prolonged winter frost, which, if not too severe, does more good than harm to vegetable life, while greatly benefiting the soil by its disintegrating effect. On the other hand, there occasionally occurs a frost extending over many weeks, when extremely low readings are registered, during which all but the hardiest plants suffer severely, while many of the more delicate species are killed outright. During the present century there have been in the neighbourhood of London eight of these memorable frosts, the average interval separating them being about 10 years. They, however, occurred so very irregularly that Table II. cannot be taken as any guide whatever as to when the next prolonged frost may be expected ; in one case the interval between them was only one year, whereas in another it amounted to 24 years.

TABLE II.—*Prolonged Frosts in the neighbourhood of London during the Present Century.*

Period		Days' duration	Temperature				Days	
			Mean max.	Mean min.	Mean	Absolute Min.	Max. 32° or below	Min. 20° or below
			°	°	°	°		
1813–14.	Dec. 26–Feb. 5	42	33·0	21·5	27·3	8·0	20	16
1838.	Jan. 5–Feb. 23	50	32·9	24·9	28·9	-4·0	19	9
1855.	Jan. 10–Feb. 25	47	34·8	24·5	29·7	11·1	15	12
1860–61.	Dec. 15–Jan. 19	36	34·9	24·8	29·9	8·0	9	8
1879.	Nov. 14–Dec. 27	44	37·2	24·7	31·0	13·7	6	4
1881.	Jan. 7–26	20	31·8	22·1	27·0	12·7	12	10
1890–91.	Nov. 25–Jan. 22	59	33·5	25·0	29·3	12·0	27	10
1894–95.	Dec. 30–Mar. 5	66	36·9	26·7	31·8	6·9	17	11

Then there are wind frosts, which, although not generally so low in temperature as in the ordinary radiation frosts, are much more trying to vegetation, as not only are the upper surfaces of the leaves chilled, but the whole plant is enveloped in a swift-flowing current of cold air. A frost in the winter has to be very keen indeed to inflict any serious injuries, but late spring frosts are greatly to be feared, as most plants are then in active growth, and covered with young and tender foliage. It is these frosts which, by destroying the blossoms and fruit-buds, so often destroy also all prospect of what would otherwise have been an abundant fruit crop. If their leaves be dry, plants will frequently escape injury from a frost, which if it had been preceded by rain would have greatly crippled them.

Much also depends upon the duration of the frost as well as upon the lowness of the temperature. As an instance of this I may state that on the nights preceding October 6 and 7, 1897, 5° and 8° of frost were respectively indicated by the thermometer exposed on the lawn

at Berkhampsted, Herts. On the first of these nights my dahlias, which were growing within a few yards of this thermometer, were not the least injured; whereas on the second night, when there were only 3 more degrees of frost, the whole of the upper part of the plants was completely killed and their flowering ruined for the season. I could not understand this at first, as the weather on both nights was apparently similar in all other respects, until I examined the thermograph trace, when I found that the coldest period on the first night lasted only about a quarter of an hour, whereas on the second night it lasted for six hours.

In protecting delicate plants in a severe winter frost, the covering requires to be very substantial to be of any real service, but it is surprising how slight is the protection necessary in most instances in the case of late spring or early autumn frosts. As often as not it is the exposure of the plants to sunshine on the morning succeeding these brief frosts which is answerable for the injuries attributed to it. The effect of very low temperatures on vegetation and also of quick thawing is thus explained by Dr. Vines in his *Student's Text-book of Botany*:—

When a part of a plant which contains a large proportion of water is exposed to a low temperature, a portion of the water contained in the cells escapes from them, and becomes frozen on their surface, the whole tissue at the same time contracting; the water does not freeze in the interior of the cells. The water which has thus escaped and frozen forms an incrustation consisting of a number of elongated ice crystals arranged side by side. This ice is very pure, for the substances in solution in the cell-sap remain behind in a more concentrated form. It has been ascertained that this formation of ice is, in itself, not necessarily fatal in all cases. If the frozen part be slowly thawed, the cells may gradually reabsorb the water and so return to their previous normal condition. If, however, the frozen part be quickly thawed, the cells cannot absorb the water sufficiently rapidly; it therefore either collects in the intercellular spaces, causing discoloration and decay, or it runs off and evaporates, so that the part dries up.

Spraying plant foliage with water, in order to thaw it before the sun is up, will be often found an effectual remedy against injury when late spring frosts occur. In the case of low-growing plants, straw, or any similar light litter, may with advantage be distributed lightly over them on the previous evening, whenever an unusually keen frost threatens, and a valuable plant or crop may in this way be saved. In the case of individual plants, I have found sprigs of heather much more serviceable than bracken, as they do not hold the damp, and are more easily applied. Early potatoes which are just above the ground will often escape injury if covered with single sheets of newspaper.

Rain.

The influence of rainfall on vegetation stands second only to that of temperature, for each kind of plant requires not only a certain degree of warmth, but also a certain degree of moisture, in order to perform its various functions in the most perfect manner. There

are two classes of farm crops, the requirements of which, as regards rainfall, differ considerably. Taking one year with another, the fall of rain in these islands more than meets the wants of the cereals as regards moisture, while there is often too little and seldom too much for the roots and grass crops. In times of drought, plants have to rely on the water in the subsoil, and consequently the deeper-rooted corn crops are less injuriously affected, when once established, than the comparatively shallow-rooted turnips, and many of the grasses. This leads us to consider the passage of rain into the soil, known as *percolation*. Of the moisture received from the clouds, the greater part during the winter half of the year descends permanently into the ground, whatever be the crop growing upon it. But it is otherwise during the summer half of the year, for even on uncropped ground only about one-fourth of the total rainfall for these six months finds permanent lodgment in the subsoil, the other three-fourths being carried into the atmosphere by evaporation. On land thickly covered with vegetation, like permanent pasture, it is only in times of exceptionally heavy rains that at this season any water at all has a chance of penetrating the soil to any depth, the whole being taken up by the herbage or evaporated. It may be mentioned in passing that it was found at Rothamsted that by the application of nitrate of soda to pasture land, the grass became deeper rooted, and was thus enabled to withstand without serious injury even the long spring and early summer drought of 1870.

The question of percolation becomes one of considerable importance when we consider how the fertility of land is lessened when the drainage is excessive. This is evidenced by the Rothamsted experiments, where the soil has been shown to be richest in nitrates after the period of least percolation; that is to say, between July and October, and poorest after the winter, when the drainage is greatest—say between April and June. The greatest loss of these valuable nitrates consequently occurs during unusually wet autumns and winters, whereas during a dry and sunny spring and summer the soil increases most in fertility. It was formerly supposed that land left fallow during the winter was benefited thereby, but it is now known that the soil retains its nitrates much more effectually if covered by a crop of some kind, and more particularly will this be the case if the winter prove a wet one. To put the matter in another way, if it were certain that any winter would be dry it might be advisable to apply nitrogenous manures to wheat crops in the autumn, but if certain to be wet their application should undoubtedly be deferred until the following spring. Winter rains may not be necessary for the immediate wants of either farm or garden crops, but they are invaluable in allowing a plentiful supply of moisture to be stored up in the subsoil for the future well-being of these crops—to say nothing of the requirements of fruit and other trees and shrubs with their deeper roots and dense foliage.

From fig. 3 it will be seen that in an average November three-fourths of the rainfall descends permanently to the ground, the

remaining quarter being evaporated, while the loss of nitrogen is greater than in any other month in the year, amounting to 6 lb. per acre, which is equivalent to 39 lb. of nitrate of soda per acre. In an average May the conditions are reversed, as less than one-fourth of the total rainfall passes into the ground, leaving the remaining three-fourths to be evaporated, while only about 1 lb. of nitrogen per acre, equivalent to 7 lb. per acre of nitrate of soda, is lost. It

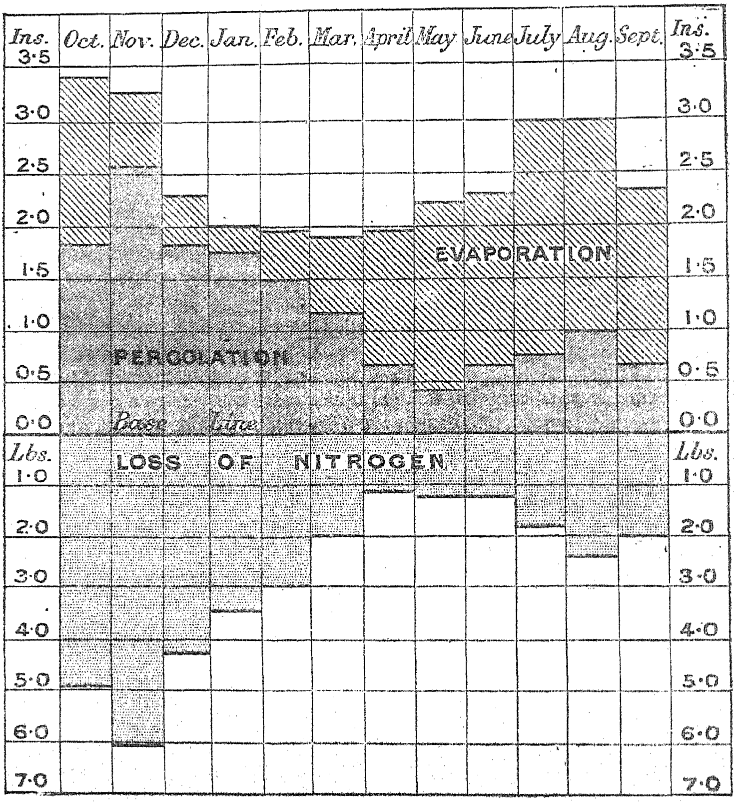


FIG. 3.—Mean Monthly Rainfall, Percolation, Evaporation, and Loss of Nitrogen at Rothamsted for the 19 Harvest Years 1877-78 to 1895-96.

will be noticed how closely the quantity of nitrogen washed out of the surface soil varies with the percolation or the amount of rain-water draining into the subsoil.

It is during the late spring and early summer, when most plants are growing more rapidly than at any other period of the year, and evaporation is greatest, that the want of sufficient rain is most keenly felt. On the other hand, continued wet during the same period

is also undesirable, principally because a long continuance of rainy weather at this season invariably means in these islands also a long continuance of unseasonably cold, humid, and sunless weather.

The great difficulty in treating of this question of rainfall consists in the different effect it has on different soils and subsoils. To take two extreme cases, heavy clays require but a moderate amount of rain, whilst deep sandy or gravelly soils can scarcely at any season have too much. Indeed, it has been said that if as much rain fell on the heavy clay lands of England as on the friable soils of Ireland, the most productive wheat soils would be comparatively barren.

It must not be forgotten that the character of the rainfall in any locality or at any period of the year is a matter of almost equal moment with the quantity. For instance, after a dry period the fall of an inch of rain on a single day during the first week would not be nearly as beneficial as if four falls of a quarter of an inch each were equally distributed over it. In the foregoing remarks I have dealt only with growing crops, but of course the character of the weather at the times of haymaking and harvest is of almost equal importance.

Droughts.

As I have separated frosts from temperature for consideration by themselves, it may be well in the same way to say a few words here as to droughts, as distinct from rainfall. Different farm crops, as previously stated, vary considerably as to their powers of enduring a long continuance of dry weather, and this power depends, as a general rule, upon the nature and depth of their roots. For meteorological purposes Mr. Symons's definitions of "absolute" and "partial" droughts have proved most serviceable, but, from an agricultural and horticultural point of view, they are often likely to be very misleading. For, when the ground has once become dry on the surface and to the depth of several inches, a fall of a tenth of an inch of rain once a week, which would soon bring to an end even a "partial drought," would prove of no service at all to vegetation generally, beyond temporarily cooling and moistening the air. Indeed, it would do more harm than good on certain kinds of soil by caking the surface, and thus tending to increase evaporation from it afterwards. What farmers would say under such circumstances would be "These light rains do no good at all: what is wanted is a good steady rain for twenty-four hours." At Rothamsted during the drought of 1870, which extended over the months of April, May, June, and July, it was found that the mixed herbage of permanent meadow-land suffered very much more than either wheat or barley; and the spring-sown barley suffered very much more than the autumn-sown wheat.

Tables III. and IV. contain lists of the most trying droughts and persistent rains which have occurred during the present century in the neighbourhood of London, at that period of the year when the growth of plants is most active.

TABLE III.—*Prolonged Droughts during the Spring and Summer at Greenwich since* 1815.

Year	Period	Length of drought	Rainy days	Rainfall
		days		ins.
1818	May 19–Sept. 1 . .	106	13	1·36
1825	May 29–Aug. 2 . .	66	4	·84
1834	April 3–June 3 . .	62	12	1·01
1844	Mar. 15–June 23 . .	101	11	·53
1854	Feb. 24–April 27 . .	63	9	·69
1870	Mar. 27–June 30 . .	96	15	1·14
1887	June 4–Aug. 15 . .	73	11	1·37
1893	Mar. 6–July 3 . .	120	24	1·59
1895	April 28–July 16 . .	80	19	1·08

TABLE IV.—*Continued Wet Periods during the Spring and Summer at Greenwich since* 1815.

Year	Period	Length of wet period	Rainy days	Rainfall
		days		ins.
1828	July 4–Aug. 14	42	27	10·04
1830	May 21–July 20	61	34	9·27
1838	May 28–July 6	40	29	6·78
1848	July 20–Aug. 31	43	38	6·10
1860	July 16–Aug. 30	46	34	6·24
1878	April 1–June 30	91	51	13·17
1879	May 23–July 24	63	43	10·39
1888	June 26–Aug. 6	42	34	10·76

When compiling these tables, it soon became apparent that during the above four months dry periods were of far greater frequency and severity in this country than wet ones. Indeed, had the same limits as to duration been adopted in the case of the wet periods as in the case of the droughts, there would have been only two of the former left to chronicle.

In the garden, plants are less at the mercy of dry weather than in the fields. At all events they should be, for even in the case of a porous soil, much may be done either by frequent watering, by mulching, or by hoeing, to enable them to withstand a long continuance of dry weather. In addition to which, the liberal application of farmyard manure will be found greatly to increase the moisture-holding capabilities of the ground, if persevered in year after year. Large fruit trees, like standard apple trees, do not appear to feel dry weather as soon as more shallow-rooted plants, but the crop is often injuriously affected in the autumn, after a spring and summer drought, by the want of sufficient moisture in the subsoil, at a period when the fruit should be swelling, and the flower-buds forming for the following season. Droughts are very detrimental to lawns, and especially to those on poor soil, as so many of the weeds growing on them stand dry weather much better than the grasses, and conse-

quently, under such conditions, gain ground more rapidly than they otherwise would.

In 1884 I carried out the following experiment in order to ascertain the effect of mulching (covering the soil with half-decayed manure, leaves, &c.) upon the moisture and temperature of the ground beneath it. I had two percolation gauges, each 3 feet square and 3 feet deep, that had been some time previously filled with the ordinary soil of my garden at Croydon, which was of rather a light and porous character. On the soil in one gauge was placed a layer 3 inches deep of half-decayed manure, while the surface of the other gauge was left uncovered. Once a week the mulching was loosened with a fork, and the soil in the other gauge hoed to the depth of

TABLE V.—*Showing the Effect of 3 inches of Mulching on Percolation, Evaporation, and Temperature.*

1884.	Soil with mulching above or below that unmulched.					Air Temperature.		Rainfall.	
	Percolation.	Evaporation.	Earth Temperature at 1 foot.						
			9 a.m.	3 p.m.	9 p.m.	Mean Max.	Mean Min.	Amount	No. of Days.
	Ins.	Ins.	°	°	°	°	°	Ins.	
January	−·11	+·11	+0·5	0·0	+0·1	48·1	39·4	2·58	16
February	+·39	−·39	+0·7	0·0	+0·1	47·9	37·4	1·78	13
March	+·51	−·51	+0·5	−0·5	−0·6	51·1	37·7	1·46	9
April	+·11	−·11	+0·6	−0·4	−0·7	52·4	37·1	1·32	13
May	+·07	−·07	0·0	−1·6	−2·0	63·1	44·0	0·56	10
June	+·05	−·05	−0·2	−1·2	−1·9	66·1	48·8	1·90	9
July	+·17	−·17	+0·2	−1·2	−1·9	71·8	53·9	1·59	16
August	+·17	−·17	+0·3	−3·7	−2·2	75·5	52·9	1·07	8
September	+·02	−·02	+0·6	−0·6	−0·6	67·0	51·6	2·38	15
October	+·16	−·16	+1·1	+0·5	+0·3	56·0	41·9	1·20	12
November	+·09	−·09	+1·2	+0·7	+0·6	47·3	36·2	1·57	12
December	+·04	−·04	+0·7	+0·4	+0·1	45·5	37·0	2·28	16
Sums	+1·67	−1·67	—	—	—	—	—	19·69	149
Means	—	—	+0·5	−0·6	−0·7	57·6	43·2	—	—

about an inch. Taking the five months ending August, when the growth of plants is most active, it will be gathered from Table V.—(1) that the mulched soil remained more uniformly moist than that unmulched; (2) that it was also more equable in temperature, being slightly warmer at night and decidedly cooler during the daytime. There were, I find, no fewer than 68 days during the same five months when no measurable quantity of rain-water passed through the unmulched soil, but on no occasion did percolation altogether cease in the case of the mulched soil. There are two important points to be borne in mind as to the application of mulching:—(1) it should not be put on, in any case, earlier than May, as it keeps

the ground cold at a time when warmth is most needed ; (2) it should never be too deep or too close in texture, or it will often do more harm than good by excluding light and air from the roots of the plants round which it is placed.

Snow.

A deep fall of snow during the winter months is always welcomed both by farmers and gardeners. It keeps the ground comparatively warm and steady in temperature, while affording the most efficient safeguard against severe frost to all plants covered by it. A slight coating is also often of considerable service, even to such a hardy plant as young wheat, owing to the protection it affords from keen frosts and biting winds.

Sunshine.

The part played by sunshine in the growth of crops is very considerable, whether we regard the influence upon them of the less refrangible rays of the spectrum, or of the highly refrangible rays. It has been truly said that heat, water, and soil can be artificially supplied to plants, but no light so suitable for vegetable life as sunlight. Almost every crop is more dependent upon sunshine at some particular period of the year than at any other. For instance, corn at the time of ripening, the grass crops in the spring, the roots in the autumn, the fruit crops when approaching maturity, and so on. In the spring months it is sunshine rather than rain that is mostly wanted : sunshine to warm the ground, for without this, rain is of little service either for the germination of seeds or for the growth of plants. Again, it has been found at Rothamsted that, while certain seasons may favour the mixed herbage of grass lands, in so far as luxuriance of growth is concerned, it is in others, no doubt during the more sunny ones, that this herbage becomes properly matured. So that in the latter case, although the yield may not be so great, the quality is very superior. Corn crops are likewise similarly influenced, some seasons favouring growth while others favour more particularly the perfecting of the grain and its maturation. In gardens, the difference in the character of the shoots made during a wet and cloudy spring and early summer is very distinct from that made in a period of almost continuous sunshine. Abundant sunshine in the autumn is also of the greatest value to a large class of hard-wooded plants and trees, and especially to fruit trees, for without this there will be little prospect of the growths of the current year becoming satisfactorily matured before the winter sets in.

There has been found to be a very close connection between the quantity of watery vapour exhaled by leaves and the degree of sunshine to which they are exposed. This being the case, and knowing as we do the important part played by this function of transpiration, as it is termed, in building up the structure of plants, it will readily be understood how much the character of their growth must be de-

pendent upon whether any particular season is unusually sunny or the reverse.

WIND.

Wind has been aptly styled the vehicle of climate, and is said to make the weather. In this country there are two main currents of very different types. The first and most prevalent is that from off the Atlantic, which comes laden with moisture, and is comparatively

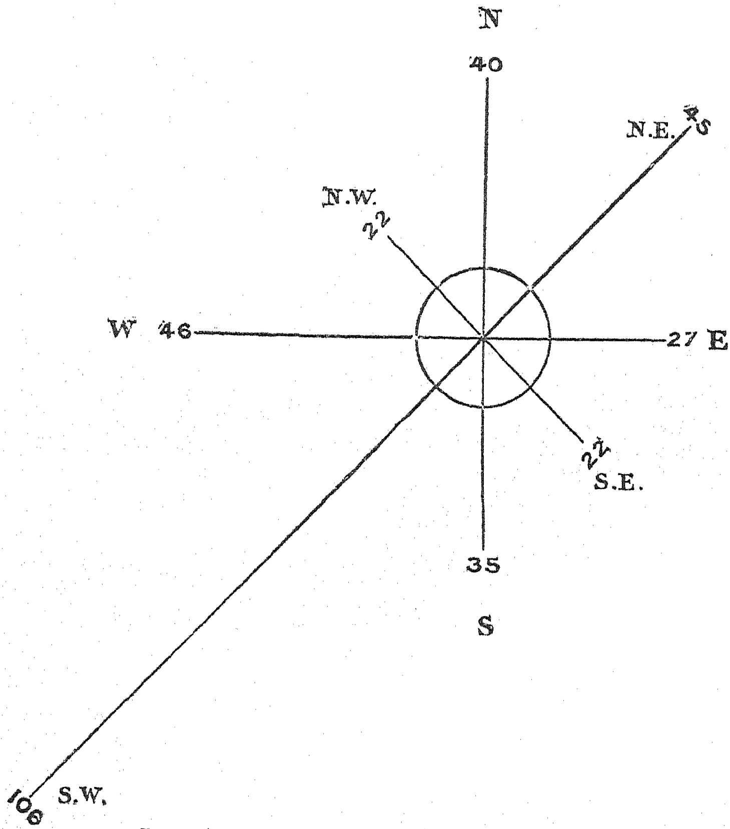


FIG. 4.—Average number of Days on which the Wind blew from different points of the compass at Greenwich, 1841-89.

cool in summer and warm in winter; while the other reaches us from the wide continent to the north-east and east, and is considerably drier, and brings our hottest summer and coldest winter temperatures. Of the latter, the north-easterly winds, so prevalent during the spring months, are the most trying to vegetation on account of their cold and harsh character. It is principally on

account of these north-easterly winds, which usually occur when the blossoms of fruit trees are opening, and the late frosts which often visit us about the same time, that the site for an orchard or fruit-garden requires selecting with considerable care. A gentle slope facing south-west would not only protect the trees to a great extent from the most trying winds, but the fall in the ground would allow of the cold air flowing past them into the valley below on frosty nights. Exceptionally high winds only occasionally—as at the blossoming time of the cereals, or in "lodging" the corn crops just before harvest—do serious injury on the farm. In gardens, particularly those situated in exposed positions, however, much damage is often done during a gale by boughs being wrenched off trees and shrubs, by fretting the leaves against the twigs and branches, and in other ways. The necessity of placing firm stakes to all plants requiring them is too often overlooked until a considerable number of plants have been overturned or broken off. Winds are also frequently the means by which the down of thistles and other light seeds are conveyed from an ill-farmed to a well-farmed field adjoining.

Fig. 4 will give a good idea as to the relative prevalence of different winds in this country. It will be seen that by far the most prevalent wind is that from the south-west, the direction next favoured being west, and that the two winds taken together monopolise 152 days, or something like half the year. These are followed by north-easterly and northerly winds, with 85 days between them; while the points least favoured are south-east and north-west. The circle in the centre of the diagram represents the number of calms in the year, viz. 22.

Farm Crops.

Wheat.—From remote times these islands have never been considered as good for corn-growing as for feeding and grazing stock. The fact is, wheat, being a native of warmer climes, requires a higher summer temperature than our climate usually affords. It is stated that in no part of Europe where wheat is grown are the summers so cold. Our average summer temperatures are also said to be almost the minimum for bringing this cereal to perfection, and that therefore a deficiency of a few degrees in mean temperature at this season must always be a great drawback to its successful cultivation. If this be the case, the difficulty becomes even greater on elevated lands, where the mean summer temperature is lower and the growing season shorter. Wheat cannot be grown as far north as either barley or oats. In Ireland, however, it is not any limits of temperature that prevent this cereal from being largely grown, but its unfavourable soil and humid climate. Even in England the yield is, as a rule, least in a rainy season and best in a dry one; but if the dryness be prolonged, the straw is neither as tall nor as vigorous. There is one important advantage which wheat possesses over other grain crops usually grown in this country, in that it may be sown in

autumn when other cereals would often perish. There are two critical periods when fine weather is of the greatest importance: the first when it is coming into flower, and the other at harvest time. Corn has always been regarded as an exhausting crop, but this has been found at Rothamsted not to arise from cereals taking more nourishment out of the land than other crops, but to be mainly owing to their short period of active growth and the long time the ground is bare, and the consequent greater loss of nitric acid through drainage. On one plot at Rothamsted wheat has been grown continuously without any manure for 54 years, and yet in an exceptionally favourable season this plot will yield even now

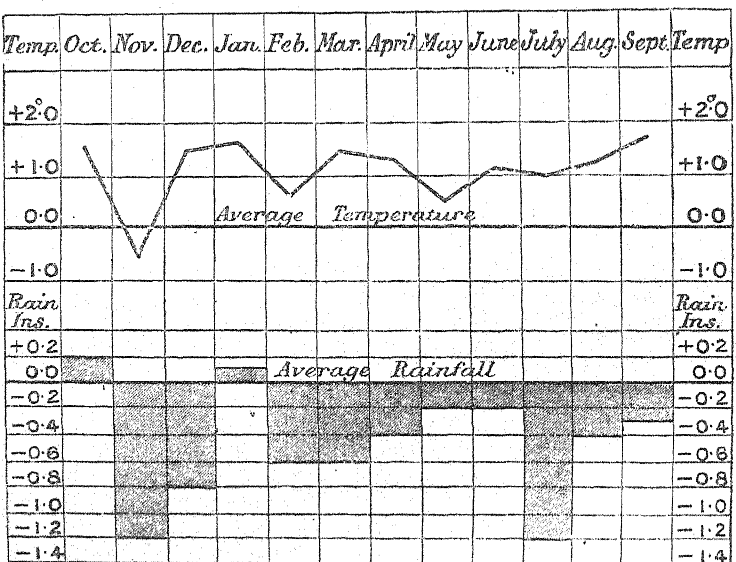


FIG. 5.—Mean Monthly Variation from the average in Temperature and Rainfall for the six years when the Produce of Wheat was highest at Rothamsted.

a better average crop than the average wheat lands of the world, or even than the rich prairie soils of America. This fact shows perhaps more clearly than any other that could be given the powerful influence that the weather has on this crop.

The accompanying diagrams, figs. 5 and 6, illustrate in a graphic manner the kind of weather which most favours, and on the other hand that which least favours, the growth of wheat in this country, at all events as regards heat and moisture. The six best years and the six worst years for wheat at Rothamsted, during a long interval, were selected, and the average weather conditions as regards temperature and moisture ascertained. The results show that the good years were, when taken together, warm and dry

throughout, while the bad years are distinguished by their generally low temperatures and persistent falls of rain.

Barley.—This grain is better suited than any other for growing near the northern limit of the corn-growing belt. In fact, some varieties will thrive where the climate is too cold and the summers too short to bring to perfection either wheat or oats. It can also be grown with advantage in warmer localities than other cereals. It succeeds best, as a rule, in the east of England, although in dry seasons it suffers much more from drought than wheat, owing to its

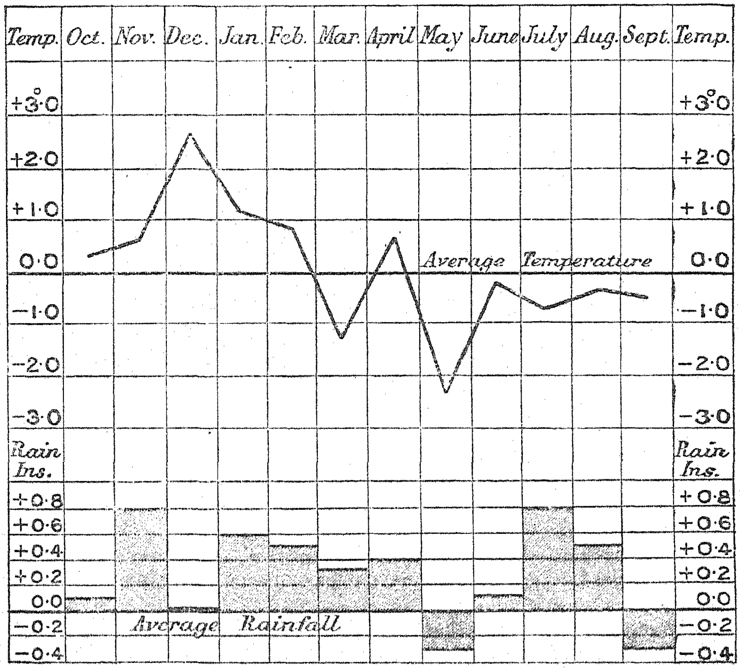


FIG. 6.—Mean Monthly Variation from the average in Temperature and Rainfall for the six years when the Produce of Wheat was lowest at Rothamsted.

greater dependence on surface moisture. Its chief requirements as regards weather are a genial showery spring and a moderately rainy summer. On the other hand, the produce is low when there is either too much or too little rain.

Oats.—This is a crop well suited to the moister districts of the British Isles, consequently we find it the leading cereal in Scotland and also in Ireland. In Ireland oats are much more largely cultivated than any other grain crop. It can also be grown with advantage at a greater elevation than either barley or wheat. On the other hand, it thrives worse than either where the climate is

warm and the summer temperature high. In consequence of its density on the ground, this crop absorbs a large amount of water.

Roots.—Taking the root crops as a whole, they are most luxuriant in the more humid districts of these islands, and, unlike corn, delight in a cool wet summer, provided the autumn be mild and sunny to mature them. Few of the roots grown in this country are sufficiently hardy to withstand severe weather, so that it becomes important that they should be stored in safe quarters as soon as possible after they have completed their growth and are sufficiently ripened and before the winter frost sets in.

Beans and Peas.—The beans sown in autumn are found, as a rule, to produce the best crops, provided the young plants escape injury from cold during the winter. They have this advantage at harvest time over cereals, that they can be cut in bad weather. Peas make their best growth in moderately wet summers, and are among the first crops to suffer from a continuance of dry weather.

Pasture Grass.—This is, after all, by far the most extensively grown crop in these islands, and the one most suitable for the climate. It is the only perfectly hardy farm crop that we grow; and although it soon shows the effects of drought, such droughts never appear to permanently injure it, for on the return of wet weather it is soon as green and flourishing as ever. As showing its extreme hardiness and ability to withstand ill-usage as compared with some other native plants, I may state that when the lawn at the side of my house was covered with three inches of snow on February 3, 1895, in order to make a skating rink there the snow was rolled and afterwards watered, and the grass remained covered with the coating of ice thus formed for the next three weeks. In the following summer I noticed that although the grass was as luxuriant as ever, not a single weed was to be seen on that particular part of the lawn, which like the rest of it had previously been thickly studded with dandelions, plantains, daisies, and other weeds. Even now, three years afterwards, it is easily to be seen, by its comparative freedom from weeds, where the skating rink had been made.

Comparing the weather influences that have proved most favourable and least favourable to the hay crop in the same way that we have done those affecting wheat, it will be noticed that there was no very great difference as regards temperature, taking the averages for the six best and the six worst years at Rothamsted during the growing period except in May and June; but that in the one case (the best years) the rainfall was rather in excess during that period, whereas continued drought is the chief characteristic of the bad years. This is doubtless due to the shallow-rooted character of the crop.

Potatoes.—The great weather enemies of this crop are late spring frosts, and too much rain during the summer months, as the latter favours that fungus popularly known as the "potato disease." This fungus generally makes its appearance towards the end of July, when

the temperature is most favourable to its growth, and close thundery weather seems to induce the disease at once.

Fruit and Kitchen Garden Crops.

Fruit.—Most of our outdoor garden fruits make the most satisfactory growth when the air and soil are moist and warm, but during the ripening period more heat and light and less moisture are required to bring the fruit to perfection, and to properly mature the young shoots, without which the production of fruit in the following year is never likely to prove satisfactory. The critical period is when the blossoms are setting, for then they are fully expanded and most exposed to the influence of frost and cold winds. For this reason it is unadvisable to plant orchards in valleys or hollows, which are so often veritable traps for frost. As different varieties of apples and other fruits vary to a certain extent in their times of flowering, and also in their after-requirements as regards weather, it will be well not to be too restricted in the number of sorts grown, and so to insure as far as possible a good crop on at least some of them, even in the more unfavourable seasons.

Kitchen Garden Crops.—What has been said about the crops on the farm as regards weather applies to a great extent to those grown in the kitchen garden, except during the winter months. At that season, there is little to be seen but young wheat and winter oats in the fields, and grass in the pastures, all three of which are much hardier than any of the crops grown in the garden for the winter supply of green vegetables. Consequently in times of extreme cold the latter suffer severely. The difference in the prices charged for such vegetables in our large towns after a mild winter compared with those charged after a severe winter will show how great has been the havoc committed in the latter case by frost among them. In other parts of the year spring and summer droughts may be regarded as most hurtful. As on the farm, so in the garden, one of the first crops to suffer in a dry summer is that of peas.

The Flower Garden.

The numerous plants cultivated for their flowers in gardens differ so greatly in their structure, habit, and times of active growth, that it is impossible within the limits of this paper to give anything more than a very slight sketch of the influence of weather changes upon them. For our present purpose they may be roughly divided into three classes, viz. hard-wooded plants, like roses; herbaceous perennials, like the Japanese anemone; and plants sensitive to cold, as dahlias, geraniums, &c.

1. Most of our roses are only half-hardy, and consequently have to contend against many weather enemies. Their requirements are best met by a dry and sunny autumn to mature the shoots made during the summer; a moderately cold winter to give them that rest which is so desirable at this season; a frostless spring to

preserve their young shoots intact; and a moderately warm and showery summer to bring their flowers to perfection. In order to show how seldom they pass through a whole year without falling victims to some hostile atmospheric influence, I may mention that for twenty years I have written the weather history of the numerous roses in my own garden, and only once or twice during that period have I been able to describe any year as even to a great extent favourable. One of the best years was that of 1897, when the weather was generally propitious, or rather there occurred in no month any weather which was specially unpropitious to their well-being. The above remarks will apply to a great extent to a large number of other garden flowers, shrubs, and trees of similar growth.

2. The next type we have to consider is that numerous class known as "herbaceous plants." These are mostly the wild plants of other countries, which die down to the ground-level on the approach of winter, and throw up fresh shoots in the following spring. The Rev. C. Wolley Dod, a leading authority on this subject, has kindly favoured me with his views as to weather influences upon them. He begins by saying that in his opinion there is no other country in the world where plants from localities and climates so widely different could be so successfully cultivated in the open air as in England. As a rule, plants from New Zealand, from the temperate parts of South America, and from the Rocky Mountains seem to have the greatest difficulty in adapting their growth to the average conditions of English gardens. He mentions some Alpine plants, which, although they can resist Arctic frost, do badly here, because they do not get the rest they require during the winter, and so fall victims to our damp atmosphere. He points out the importance of a dry sunny time in May to ripen spring bulbs after flowering, without which ripening they cannot be expected to bloom freely the following year. He concludes by expressing the opinion, with which I entirely concur, viz. that a wet summer with alternating periods of sunshine, in other words a showery summer, is the most favourable in all English gardens, even in those on a retentive soil, like that of Mr. Wolley Dod's, near Malpas in Cheshire. There are many florist's flowers and other perennials, besides those known as herbaceous, to which the above remarks will almost equally apply.

3. Lastly, we come to plants which are only grown in the open ground during the summer half of the year, like dahlias. Almost every district differs as to how early in the year such plants can be safely planted out, this depending upon the comparative liability of different districts to keen late frosts. Such plants, particularly dahlias and nasturtiums, fall easy victims to the first frost of any severity in the autumn. If I may regard the autumn climate of my gardens at Croydon and Berkhamsted, taken together, as representing approximately that of the home counties, I may state that the earliest date at which dahlias have been killed to the ground in the last twenty-one years has been October 3 in 1888, and the latest

December 1 in 1894; the average for the whole period being November 3.

Injurious Insects.

It is often supposed that during very cold winters a large number of insect pests must be killed; this, however, is far from being the case. Indeed, on the contrary, it is usually in a mild, or still more in a fitful, winter that such insects are destroyed wholesale. The fact is, most of them are able to withstand almost any degree of frost as long as they remain in their selected winter quarters, whether these be above or below ground; but with the advent of unseasonably warm weather at this season, they are tempted out of these shelters, and fall easy victims to any sudden sharp frosts that may afterwards occur.

Plant Phenology.

Accumulated temperatures only deal with one element affecting plant life, heat; whereas in noting the times of flowering of native plants, we obtain, as it were, records of the cumulative effect upon them of heat, light, and moisture. As phenological reports are issued by the Royal Meteorological Society annually, I need but refer briefly here to this branch of its work. Indeed, it is only during the last seven years that the observations have been made on one uniform plan by a sufficient staff of observers to allow of any definite conclusions being drawn from the data collected; while some of the districts into which the British Isles are divided in these reports are even now more or less inadequately represented. Nevertheless, the following particulars may be of interest as showing the relative forwardness of vegetation in those districts where the observations are sufficient to warrant such comparisons being made.

Taking the mean dates for the Midlands, as representing the country as a whole, we obtain the following results for the seven years:—

England, the Midlands, Average.

England, east,	3 days early.	England, north-west,	2 days late.
„ south,	5 „ „	Ireland, north,	5 „ „
„ south-west,	6 „ „	England, north-east,	9 „ „

So that in England alone there is an average difference of 15 days between the most forward and the most backward districts.

Again, taking the mean dates for the 12 plants on the Society's list coming into flower during the first six months of the year, and confining ourselves to the Central or Midland district of England, the difference between the most forward and the most backward season of the seven years comes out as 25 days. Of course with any particular kind of plant the range is considerably greater. For instance, the average date for the blackthorn in 1894 was March 28, and in

1891 May 2; while the hawthorn was first in blossom in 1893 on April 23, and in 1891 it did not flower till May 29—giving a range for these two shrubs of respectively 35 and 36 days.

Observations of the flowering of cultivated plants, provided the same specimens be noted each year, are of interest as showing the comparative forwardness or lateness of the seasons in any particular locality. But the varieties of these are now so numerous, that such plants are of little service for comparing the relative progress of vegetation in different parts of the country, the conditions under which they are grown varying so much more than with our native species.

Conclusion.

The foregoing is but a hasty and imperfect review of an extremely wide subject. I trust, however, I have at least made one thing perfectly clear, and that is the powerful influence, both for good and ill, that all important weather changes have upon cultivated plants in this country. Most farmers and gardeners understand this in a way, but few realise to its full extent the power and waywardness of the master they have to work with and serve under. Our native plants are naturally hardy, and it is only occasionally that weather influences seriously affect them. But then it must be borne in mind that they only grow, as a rule, in places and in soils where their modest requirements are fully met. It is when we try to grow plants in a variety of soils and situations, for which they are not by nature adapted, that we begin to find out what a number of enemies of all kinds they have to contend against. Indeed, it is a species of warfare in which the conditions are sometimes favourable and sometimes unfavourable, and in the latter case it often becomes a long struggle for existence against adverse circumstances. But the contest is not so unequal as would at first appear, for most of the crops and plants we grow appear to be endowed with true British endurance, and seem never to know when they are beaten. I of course refer to the wonderful recuperative powers which most plants possess, and which enable them to recover to a great extent even from seemingly irreparable injuries.

There are a few lessons which all tillers of the soil, whether in garden or on farm, may learn from a consideration of this question of the effect of weather upon vegetation, viz.—

1. To grow such crops, and such varieties of each, as can be cultivated with the greatest success in the soil at their disposal, and in the particular climate in which their lot may be cast.

2. To follow the best modes of culture for each crop. For it will be found that crops on ill-cultivated land are, as a rule, far more at the mercy of seasons than those on land which is highly cultivated. Besides which, it has been shown at Rothamsted that a full crop, instead of impoverishing the soil, leaves it, as a rule, in better hear than a poor one.

3. It is also advisable not to place too many eggs in one basket, but rather to grow a variety of crops, knowing, for instance, as we

do, that a season favourable to grass and roots is often unfavourable to corn, and *vice versâ*.

4. Another very important lesson taught by the fickleness of our climate is, that each farm and garden operation should, as far as practicable, be begun directly a spell of weather favourable for it sets in, for we never know how soon such a propitious period may come to an end, or how long the adverse conditions which may succeed it will continue.

IMPORTED DAIRY PRODUCE.[1]

Butter.

In comparison with the preceding year, the Australasian butter season, 1898–99, was characterised by two most satisfactory features, viz. an increased import into the United Kingdom of over 2,000 tons of butter, and an average rise in price of nearly £4 per ton. This doubly favourable result must have been extremely welcome to the long-suffering farmers of the Australian Colonies, who have had the misfortune to be visited by four consecutive seasons of drought. Until five years ago the development of the dairy industry went forward by leaps and bounds, and during the season 1894–95 over 12,000 tons were exported to the United Kingdom. That was the greatest export season of the Australian Colonies. Since then, owing to drought, shipments have, year after year, suffered diminution. The increase during the past season may be the harbinger of a series of prolific years to come, for there appears every reason to believe that the drought has now almost passed away. Should this be so, next season ought to show a record of the highest export yet reached. To do this it will require an increase over the past season of 2,500 tons, which is far less than the average yearly increase before the drought appeared. New Zealand is a land where fortunately severe drought is unknown, and the past season exhibits a greater import from that country than any of its predecessors. The steady increase in the supplies of New Zealand butter during the past five years is in favourable contrast to any of the other Australasian Colonies. Since 1894–95 the import has nearly doubled. Then the New Zealand quota was less than a sixth of the Australasian total; now it has become nearly a third. Though there is thus a very favourable increase in the total Australasian supply, it is not an augmentation all along the line, for, compared with the previous season, New South Wales and Queensland have sent reduced quantities of 150 and 185 tons respectively, while South Australia has sent an increased amount of 157 tons, New Zealand of 386 tons, and Victoria of 1,936 tons, which shows that the Colony of Victoria alone is practically responsible for

[1] From Messrs. W. Weddel & Co.'s *Australasian Dairy Produce Review* (Season 1898–99).

the total increase. Table I., showing the quantities of Colonial butter imported into the United Kingdom during the Australasian season, *i.e.* from September to April, exhibits the imports from all the Colonies for each of the last five seasons.

TABLE I.—*Imports of Colonial Butter during the Australasian Butter Season.*

Season	Victoria	N.S. Wales	S. Australia	Queensland	Total Australian	New Zealand	Canada	Grand Total
	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
1894–95	205,308	26,338	11,633	—	243,279	46,093	—	289,372
1895–96	143,651	1,058	6,984	—	151,693	51,166	31,067	233,926
1896–97	140,701	32,316	1,393	1,273	175,683	61,763	66,810	304,256
1897–98	106,745	44,685	163	5,757	157,350	73,607	85,050	316,007
1898–99	145,358	41,703	3,312	2,749	193,122	81,332	121,989	396,443

Canada, it will be noticed, is making very rapid strides, the import being four times what it was three seasons since. The bulk of the Canadian supply reaches this country before Christmas, and though it comes upon the market when prices for butter in the United Kingdom are highest, yet for geographical reasons it cannot be a fresh spring grass butter, but must be either a summer grass butter and cold-stored or fresh fodder-made. Nevertheless, it is an excellent article, and must come into conflict with Australian, though it competes more directly with Danish, Swedish and Finnish.

Regarding the advance in price, the most interesting feature is that "Finest" quality (2nd Grade) has risen more than the "Choicest" (1st Grade). In the former the value has advanced fully four guineas a ton, while in "Choicest" the rise is about three guineas, but as the quantity of "Finest" is more than three times that of "Choicest" it is safe to say the average rise is nearly 4*l.* per ton. This difference in the augmented value is due solely to quality, and shows that a greater advance in quality is being made in the second grade than in the first. One of the minor features of the past season has been the nearer approach in price of the two grades than in any previous season. The average difference in value between the two grades in the past season was 4*l.* 7*s.* per ton, while in the previous season it was 5*l.* 9*s.* The rise in price of "Finest" quality, however, was not uniform over all the Colonies, but was mostly confined to Victoria and New Zealand. There was scarcely any improvement in the "Finest" quality from New South Wales. This feature may be owing to the exceptional severity of the drought in that Colony, or it may be due to the growing custom among the New South Wales farmers of separating their own cream and taking it to the factories only every few days, instead of daily. Most probably the latter is the real cause, for it is impossible for farmers without any artificial refrigerating appliances to control the ripening of their cream so well as it is done in a properly

equipped factory. If this practice be allowed to increase, the remedy for the factories will either be to refuse to receive cream so treated, or to pay less for it. The depreciated price that such butter brings in the British market should prove a wholesome corrective to this slovenly practice of the farmers.

Review of the Market.—The season opened on October 17, when "Choicest" quality made 110*s.* to 112*s.* per cwt., a small quantity making 114*s.*, while "Choicest" Danish at this time was 116*s.* to 118*s.* "Finest" brands of Australian made 104*s.* to 108*s.*, and "Finest" Danish brought 112*s.* to 114*s.* Only once during the last six seasons has Australian opened at higher figures, viz., in October, 1893, when the price was 116*s.*, but that was the year of great drought in Europe. The high price at the opening this season restricted purchases, and values fell weekly by 2*s.* per cwt., until November 11, when the price was 104*s.* to 106*s.* After remaining at this figure for a fortnight, an advance to 108*s.* occurred, and during the next fortnight values rose to 114*s.* to 116*s.*, which was the highest price of the season. The first arrival of New Zealand butter took place in the beginning of December, the cargo fortunately striking the top of high prices, and making 108*s.* to 114*s.* for "Choicest" and 100*s.* to 106*s.* for "Finest." For about a month the values of New Zealand butter remained 2*s.* under Australian, and then for the rest of the season both varieties were quoted alike. Values fell from their highest point during the second week in December as rapidly as they had risen, and before Christmas 104*s.* to 106*s.* were the top quotations for "Choicest," and "Finest" was selling at 98*s.* to 100*s.* Danish all this time rose and fell in harmony. The market continued weak, and values receded until the middle of January, when "Choicest" Australian was quoted at 98*s.* to 100*s.* and "Finest" at 94*s.* to 96*s.* A slight upward spurt was made during the first week in February, when "Choicest" reached 104*s.*, and then a decline followed, and by the first week in March the top quotation for "Choicest" was 98*s.* and for "Finest" 94*s.* These figures were maintained all through March, but early in April an advance of 2*s.* occurred, which continued until the last week in the month, when a fall of 4*s.* closed the season.

The average price of Danish butter for the five seasons is 8*s.* 9*d.* per cwt. above that of Australasian, but if the comparison be made between the two varieties for each of the last five years in succession, the average price of Australasian, instead of approaching nearer and nearer to Danish, appears as if it would settle permanently at a level of over a penny per lb. less. This danger of an inferior position deserves the very urgent attention of all engaged in the dairy industry in the Colonies. When the old London Butter Committee was in existence a strong and united influence permanently existed to raise the price as near as possible to Danish, but since the dissolution of that Committee this wholesome influence has disappeared. Unless some organised body in this country be elected to give cohesion to the trade on this side, and advocate the intrinsic merits

of Australasian butter, it will permanently fall into a lower position than its qualities fully entitle it to occupy.

Pasteurisation.—In Victoria the pasteurising system is growing rapidly, though it is meeting with some opposition. In New South Wales, however, pasteurising has proved triumphant over its opponents. Dr. John Hay, the owner of the Berry estate, induced the Government Department of Agriculture to introduce the pasteurising system to the dairy industry, but at first it met with little success, except at the Berry Central Butter Factory, where the advantages of pasteurisation have demonstrated themselves beyond all dispute, and now the system is being largely adopted in New South Wales. At the last Royal Agricultural Show in Sydney the Berry Central Butter Factory won three first prizes, and the champion prize with pasteurised butter against unpasteurised. Since then the same factory has won the State prize for export butter, gaining 93 points out of a possible 100, the second competitor with ordinary-made butter obtaining only 74 points. Such a triumphant result is an object lesson for every butter factory in Australasia.

Imports.—The imports of butter in 1898 reached 160,454 tons, but for the first time since 1887 fell below those of the previous year. Though the decline was not large, it was relatively very significant. For some time the imports have so regularly and largely exceeded those of the preceding year that it is very surprising to find an actual decrease. From 1888 the increase year by year in tons over the previous year has been 7,915, 12,820, 4,994, 5,394, 2,370, 7,224, 12,318, 12,542, 10,602, 9,044, but in 1898 instead of an increase there was an actual decrease of 435 tons. The main deficiency of supply appertained to the following countries :—United States 4,374 tons, Russia 2,092 tons, France 1,565 tons, and the colony of Victoria 2,243 tons. Sweden, Holland, Germany, Norway, and the colony of New Zealand also showed small deficiencies. The only sources from which largely increased supplies came were Denmark 6,515 tons, and Canada 2,373 tons. Small increases of 293 tons and 193 tons came respectively from Belgium and Argentina, while three Australian colonies augmented their supplies, viz. New South Wales 528 tons, Queensland 285 tons, and South Australia 72 tons.

The reason for the decline in the imports was mainly the relatively higher values that existed in the exporting countries. This was emphatically the case in the United States, where prices for all kinds of provisions were higher than in 1897, and there is every prospect during the current year of the American export being restricted from the same cause. In some other exporting countries the reduced value was not so great a factor as the short supply, owing to the hot or the droughty weather that prevailed there, notably in France and Victoria. The decline in Russian, Swedish, Dutch, and other varieties of butter was caused by the large production of home-made butter in the United Kingdom, which, following on the large make of 1897, caused prices to be low

in provincial districts, and thus only the most cheaply produced foreign butter could find a profitable market. With regard to Germany, the consumption is growing year by year, and will soon cause a cessation of export; a very large portion of the 2,011 tons entered in our Customs Returns for 1898 as German is really Italian butter, sent *via* Germany.

Season v. *Year*.—From the fact that the Australasian butter trade is a season trade, and does not fall within any one calendar year for which the Customs Returns are made, but occupies parts of two years, it is difficult in comparison with other countries to appreciate the exact progress that the Australasian colonies are making in the supply of butter to the United Kingdom season by season. If, however, the six winter months October to March (which comprise nearly the whole of the Australasian season) be taken, and the imports for this period compared with those of other countries, it will be seen that, notwithstanding the enormous disadvantages of four consecutive seasons of drought, the competitors of Australia and New Zealand have already found Australasia to be a doughty opponent, and are increasing their supplies to British markets in those months when there is no Australasian competition to meet.

For instance, the total imports from foreign sources during the last five Australasian seasons have increased by only 10,250 tons, while during the non-Australasian season the increase for the same five periods is 16,430 tons. A study of Tables II. and III. brings out this fact very clearly, and it is one of very great encouragement to the dairy industry of the Southern Hemisphere. The only foreign country that has increased its supply to the United Kingdom to any great extent during the past five Australasian seasons has been Denmark.

During the non-Australasian season Denmark, Russia, Holland, Canada, France, the United States, Sweden, Norway, Argentina, and Belgium show increases of 8,953, 3,303, 3,478, 2,843, 1,173, 707, 534, 242, 239 and 55 tons respectively, while the only foreign country that shows a decrease is Germany. It is thus very evident that Australia and New Zealand are successfully ousting some of their competitors from the British markets, and if in the next five years Australia be less afflicted with drought most of their opponents will be driven to send their supplies more and more during the non-Australasian season.

CHEESE.

The New Zealand Cheese season in England generally begins in January and ends in May. This year the season opened at the very end of January, when "Choicest" quality brought 47*s*. to 48*s*. per cwt., while "Finest" realised 45*s*. to 46*s*. These were very good prices, being 6*s*. or 7*s*. per cwt. more than at the opening of the previous season. All through the season of 1897–8 prices were so very low that many makers in New Zealand turned their attention

TABLE II.—*Estimated Home Production and Imports of Butter into the United Kingdom for the Six Months ended March* 31, 1895 *to* 1899.

Year	HOME *estimated*	COLONIAL				FOREIGN											Total Foreign	Grand total
		Australia	Canada	New Zealand	Total Colonial	Argentina	Belgium	Denmark	France	Germany	Holland	Norway	Russia	Sweden	United States America	Other countries		
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
1895	39,000	11,127	611	2,136	13,874	—	865	25,933	11,870	3,821	3,481	408	1,790	7,598	288	54	56,109	108,985
1896	35,000	7,557	1,272	2,076	10,905	500	1,306	29,944	11,452	3,912	3,961	368	2,623	8,521	3,648	27	66,267	112,172
1897	35,000	8,700	2,203	2,215	13,118	536	1,081	29,648	10,882	2,379	5,107	610	2,718	7,594	4,968	36	65,659	116,777
1898	38,000	7,607	2,258	3,157	13,022	543	782	32,759	10,906	1,532	4,936	724	3,629	7,895	1,516	46	65,298	116,320
1899	39,000	9,179	4,532	3,331	17,042	687	1,415	35,003	8,115	1,319	4,858	817	2,635	6,932	4,562	24	66,367	122,409

TABLE III.—*Estimated Home Production and Imports of Butter into the United Kingdom for the Six Months ended September* 30, 1894 *to* 1898.

1894	48,000	1,804	446	1,152	3,402	—	663	29,980	10,459	2,888	5,178	391	2,406	6,541	460	77	59,043	110,445
1895	48,000	2,696	734	714	4,144	32	328	30,549	11,078	1,997	5,951	350	4,428	7,305	977	48	63,043	110,187
1896	44,000	512	2,364	487	3,363	196	620	32,137	11,879	1,831	7,045	420	4,970	7,960	3,204	75	70,337	117,700
1897	48,000	1,288	3,344	1,375	6,007	68	546	35,400	11,598	475	8,881	713	6,566	7,471	4,454	76	76,248	130,255
1898	48,000	218	3,289	757	4,264	239	718	38,933	11,632	595	8,656	633	5,736	7,075	1,167	96	75,480	127,744

to butter this season instead of cheese, and must have regretted their action, as prices of the latter have been very good, advancing in April as much as 12*s.* per cwt. above last year. The average price for February, March, and April, in the season under review, compared with that of 1897–98, shows an increased value of 7*s.* 8*d.*, 10*s.* 2*d.*, and 11*s.* per cwt. respectively. Table IV., which gives the prices of Canadian Cheddar cheese in London for the last five years, shows how year by year values alternate, especially from October to the following April.

TABLE IV.—*Average Top Prices per cwt. of Canadian Cheddar Cheese in London*, 1894–5 *and* 1898–9.

Year	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Average for Year
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
1894–5	63 9	50 9	48 0	47 7	50 7	53 0	52 6	53 0	52 6	51 6	50 7	51 0	52 1
1895–6	46 6	38 0	40 3	41 4	41 3	42 0	47 5	46 9	46 6	46 0	45 0	46 6	43 11
1896–7	48 9	47 0	45 0	43 6	44 6	51 0	53 6	52 9	55 2	60 9	59 2	58 3	51 7
1897–8	57 5	48 6	43 5	44 0	47 9	47 7	46 6	45 3	44 2	43 0	42 3	42 9	46 0
1898–9	46 3	41 3	38 9	40 3	41 9	44 10	45 6	49 7	50 9	50 0	52 3	54 2	46 3
5 *Years' Average*	52 6	45 1	43 1	43 4	45 2	47 8	49 1	49 5	49 10	50 3	49 10	50 6	47 11

It is a fact worthy the attention of the New Zealander that if prices are low one season they are almost sure to be high the next, and the reason of this is mainly explained by the action of the cheese manufacturers themselves. When prices are low many Canadians and New Zealanders stop manufacturing cheese and make butter instead, consequently supplies are lessened and prices rise; or when prices are high an opposite practice is followed, and the increased supplies produce a fall in prices. From the opening of the New Zealand season values rose steadily, and at the end of March "Choicest" reached 52*s.* and "Finest" 49*s.*, which was 12*s.* over the corresponding date of the previous season. All through April values remained unchanged, but in May advanced to 54*s.* for "Choicest" and 50*s.* for "Finest," the top prices of the season. It is very doubtful if the New Zealand cheese-maker reaped the advantage of the difference in value of the two seasons. Generally speaking, he sells his output instead of consigning it for sale, and there is no doubt at all that not only in the past season, but on an average of all seasons, he loses, and the merchant makes the profit. In regard to Canadian cheese the average price for the year for "Choicest" quality was 46*s.* 3*d.*, being only threepence per cwt. more than the previous year, while New Zealand was for the season 50*s.* 9*d.*, against 40*s.* 4*d.* for the previous season.

Imports.—The total import of cheese in 1898 fell short of that in 1897 by 13,200 tons. The principal countries sending diminished supplies were the United States with 7,281 tons deficiency, Canada with 4,724 tons, and New Zealand with 1,200 tons. The estimated

TABLE V.—*Estimated Production of Milk, Butter, and Cheese in the United Kingdom from* 1889 *to* 1898.

Year	Total number of cows and heifers in milk or in calf on June 4	Number of cows per 1,000 of population	Number of cows and heifers giving milk all the year round; say 75 per cent. of total	Influence of season. Percentage above or below the average of previous 10 years	Estimated total quantity of milk produced in the 52 weeks by 75 per cent. of the total herd, at 49 cwt. or 531 gallons per cow	Estimated total quantity of butter produced in the 52 weeks, taking 32 per cent. of the total milk to yield 80 lb. of butter per ton of milk	Estimated total quantity of cheese produced in the 52 weeks, taking 20 per cent. of the total milk to yield 220 lb. of cheese per ton of milk
					Tons	Tons	Tons
1889	2,814,593	102·6	2,860,945	+ 5·3	7,380,808	84,351	144,980
1890	3,956,220	105·5	2,967,165	+ 3·0	7,487,640	85,572	147,078
1891	4,117,707	108·9	3,088,281	Average	7,566,288	86,472	148,624
1892	4,120,451	108·1	3,090,339	– 5·6	7,147,337	81,684	140,394
1893	4,014,055	104·4	3,010,542	– 9·0	6,712,004	76,709	131,843
1894	3,925,486	101·2	2,944,115	+ 6·3	7,667,505	87,628	150,611
1895	3,937,590	100·5	2,953,193	– 3·5	6,982,087	79,652	137,148
1896	3,958,762	100·0	2,969,387	– 4·0	6,983,999	79,817	130,000
1897	3,984,167	99·7	2,988,126	+ 3·1	7,547,856	86,261	148,260
1898	4,035,501	100·0	3,025,526	+ 3·2	7,645,105	87,372	150,171
10 Years Average	3,986,453	103·0	2,989,761	– 1·2	7,312,062	84,051	142,910

NOTE.—In estimating the quantity of milk, butter, and cheese produced within the United Kingdom for each of the last ten years, the "average milking life" of a cow is taken to be four years, from which it follows that on the average one-fourth of the total herd has to be renewed every year by heifers with their first calf. This leaves 75 per cent. of the total herd giving milk throughout the year. Each cow of this 75 per cent. is estimated as yielding 49 cwt. or 531 gallons of milk annually. It is assumed that 15 per cent. of the total milk yield is used for the calf, 32 per cent. is utilised for butter-making, 20 per cent. for cheese, and the remaining 33 per cent. consumed in the household as fresh milk. A ton of milk produces 80 lb. of butter or 220 lb. of cheese. A gallon of milk weighs 10·33 lb. (10⅓ lb.). The probable effects of each season upon the production have been fully considered in making these estimates.

home production was nearly 2,000 tons more than in the previous year. The colonial supply reached 73,839 tons, and the foreign amounted to 43,033 tons. The estimated home production was 150,000 tons; thus the total amount for consumption was close upon 267,000 tons.

Home Production of Milk, Butter, and Cheese.

The *estimated* quantity of milk, butter, and cheese, as indicated in Table V., produced in the United Kingdom in 1898, has been exceeded only once in the last thirteen years, viz. in 1894. In that year the excess over 1898 was 22,400 tons of milk, 256 tons of butter, and 440 tons of cheese, while the number of the milking herd was 110,000 less. The milking herd of the United Kingdom last year numbered 4,035,500 head, and it is estimated that they produced 7,645,000 tons of milk, or 97,000 tons in excess of 1897. Of this quantity 1,146,000 tons were required for rearing and fattening calves; 2,523,000 tons were used as new milk in the household, and the remaining 3,976,000 tons produced 87,372 tons of butter, and 150,171 tons of cheese. Since 1891 the milking herd in proportion to the population has year by year been diminishing. In 1891 it was 108·9 per thousand of the population, and in 1897 had sunk to 99·7. Last year, however, there was a slight improvement, and the proportion rose to just 100, or, in other words, one cow to every ten persons in the United Kingdom. The reason for the very large home production was the excellent crop of grass and hay in the country.

Prospects for Next Season.

Butter.—As beneficial rains have been pretty general throughout the butter-producing districts in Australia, it is reasonable to anticipate that next season the amount of butter sent to this country will be considerably larger than during the past season, especially from New South Wales, Queensland, and South Australia. From New Zealand larger supplies are almost certain to arrive.

The supply from the United States this year is expected to be less than last, owing to a smaller production and to the working and artisan classes there being so fully employed that their increased purchasing power will cause a bigger home consumption. In Canada the make of butter is likely to increase and also the export, but it is difficult to estimate even approximately what the receipts will be.

In Europe, owing to the last two winters being mild and the summers very prolific in fodder, the farmers have been enabled to increase their dairy herds, and consequently there is every prospect of a larger home and continental supply.

Cheese.—The high prices which prevailed for some months before the Canadian and American cheese season closed will act directly as an incentive to a larger production this year. New Zealand is likely to feel a similar impulse and increase her output.

THE SALE OF FOOD AND DRUGS ACT, 1899.

This Act, which is of more importance to agriculture than its title infers, received the Royal Assent on August 9 last, and comes into operation on the first day of the New Year (1900). Only the first eleven of its twenty-eight sections directly concern agriculture, most of the remainder providing for the amendment of the present Sale of Food and Drugs Acts in directions that need not here be specified. It is proposed to limit the present note to these agricultural provisions, but before proceeding to describe them it may be well to refer briefly to the events that have led to their enactment.

With the trade in butter substitutes which began to develop about twenty years ago there sprang up frauds by which many of such substitutes were palmed off as genuine butter. Various Bills for the prevention of these frauds were introduced into Parliament, and in 1887 two Bills of the kind were referred to a Select Committee, who took evidence and reported in favour of the measure which became law as the Margarine Act of 1887. This Act prohibited the sale of compounds prepared in imitation of butter under any other name than that of "margarine," and contained other provisions which have had an important influence in checking fraud, especially by retail vendors. Experience of its working, however, has shown that its provisions have been successfully evaded by wholesale dealers and importers; and the laxity of many of the local authorities in taking samples and instituting proceedings under the powers which the Act conferred upon them has rendered it still further inoperative.

In consequence of the comparative failure of the Margarine Act, the Select Committee on Food Products Adulteration was appointed in 1894 at the instance of the Chambers of Agriculture. The Committee sat through the three sessions of 1894, 1895, and 1896, presenting three volumes of evidence and, on July 9, 1896, an exhaustive report, upon which the subsequent attempts at legislation have been based. These included a "Sale of Food and Drugs Bill," introduced by the President of the Local Government Board towards the close of the session of 1897, but not proceeded with, and an "Agricultural Products &c. (Adulteration) Bill" introduced (also by Mr. Chaplin) in the session of 1898. This Bill was likewise withdrawn, but it marked an advance from the agricultural point of view, and prepared the way for the present Act, introduced and carried this year by the President of the Board of Agriculture.

Marking and Sampling of Foreign Imports. (Section 1.)

Section 1, which consists of seven sub-sections, enacts that all imports into the United Kingdom of margarine or margarine-cheese shall have these words conspicuously marked on the packages;

adulterated or impoverished butter (other than margarine), or adulterated or impoverished milk or cream, must also be conspicuously marked with a name or description indicating that the butter or milk or cream has been so treated ; condensed, separated, or skimmed milk must be labelled on the tins or receptacles with the words "Machine-skimmed Milk" or "Skimmed Milk" printed in large and legible type. Importers who fail to comply with these provisions are liable on summary conviction to fines not exceeding 20*l.* for the first offence, 50*l.* for the second offence, and 100*l.* for any subsequent offence. Great elasticity is given to the term "importer," which is made to include any person who as owner, consignor, consignee, agent, or broker "is in possession of, or in anywise entitled to the custody or control of, the article." Provision is also made under this section for the taking of samples of the above-named articles of food at the ports of entry by the Commissioners of Customs, and for their analysis by the principal chemist of the Government Laboratories. The duty is also laid upon the Commissioners of Customs of undertaking prosecutions for offences under this section. By a further provision, the section may be applied by Order in Council to any other adulterated or impoverished article of food that may be imported under false or misleading names. Thus adulterated foods of all descriptions may be brought under the operation of the Act as occasion arises. Where the Commissioners of Customs are of opinion that an offence under this section has been committed, they are required to communicate to the Board of Agriculture the name of the importer and such other facts as they may have or can obtain as to the destination of the consignment. For the purposes of this section any article of food is considered as adulterated or impoverished if mixed with any other substance, or if any part of it has been abstracted "so as in either case to affect injuriously its quality, substance, or nature :" but the right to add preservatives or colouring matters is retained, so long as these are of "such a nature and in such quantity as not to render the article injurious to health."

Powers of Central Authorities. (Sections 2 and 3.)

Section 2 empowers the Local Government Board in matters affecting the "general interest of the consumer,"[1] and the Board of Agriculture in matters affecting "the general interests of agriculture in the United Kingdom," to take samples under the Sale of Food and Drugs Acts for analysis and to communicate the result to the local authority, whose duty it will then be to act as if

[1] It may be noted that the Bill as originally introduced only provided for the intervention of the Board of Agriculture "in the general interests of Agriculture in the United Kingdom." The similar power which the Act now confers upon the Local Government Board in the "general interest of the consumer" was added by the Grand Committee on Trade and Agriculture to which the Bill was referred; and thus a double strengthening of the law has been secured.

the samples had been taken and the analyses made under their own direction.

Section 3 imposes definitely upon the local authorities the duty of appointing public analysts and of putting into force the powers with which they are entrusted. In the case of failure on the part of the local authorities to execute or enforce the provisions of the Sale of Food and Drugs Acts with regard to articles of food, the Local Government Board, in the consumer's interest, and the Board of Agriculture, in the agricultural interest, may carry out the law by their own officers, the expenses incurred in doing so being chargeable to and recoverable from the local authorities. It is also provided that an order of the Board concerned shall be conclusive in respect of default, expenses, &c., and that any public analyst appointed under the Acts shall furnish proofs of competency under regulations framed by the Local Government Board.

Normal Constituents of Dairy Produce. (Section 4.)

The question of food standards is admittedly one of great difficulty and complexity, and the way in which it has to some extent been dealt with is best shown by the exact words of the Act. Section 4 is as follows:

> The Board of Agriculture may, after such inquiry as they deem necessary, make regulations for determining what deficiency in any of the normal constituents of genuine milk, cream, butter, or cheese, or what addition of extraneous matter or proportion of water, in any sample of milk (including condensed milk), cream, butter, or cheese shall for the purposes of the Sale of Food and Drugs Acts raise a presumption until the contrary is proved that the milk, cream, butter, or cheese is not genuine or is injurious to health, and an analyst shall have regard to such regulations in certifying the result of an analysis under those Acts.

The Select Committee in their Report of 1896 recommended the constitution of a Court of Reference having authority to prescribe standards and limits of the quality and purity of food. Under the Act, the Board of Agriculture has been constituted such an authority in respect of dairy products only.

Marking of Margarine and Margarine-cheese. (Sections 5 and 6.)

Section 5 extends the provisions of the Margarine Act of 1887 to "margarine-cheese," and enacts that all margarine-cheese sold or dealt in otherwise than by retail shall either be enclosed in packages marked in accordance with the Margarine Act, as amended, or be itself conspicuously branded with the words "margarine-cheese." Section 6 enacts that the brands or marks shall be on the package itself, and not solely on a label, ticket, or other thing attached thereto, and that the letters printed on the paper wrappers in which margarine or margarine-cheese is sold shall be "capital block letters not less than half an inch long and distinctly legible," and that "no other printed matter shall appear on the wrapper."

Margarine Registers and Factories. (Section 7.)

Section 7 provides that all occupiers of margarine and margarine-cheese factories, and all wholesale margarine dealers, must keep registers open to the inspection of any officer of the Board of Agriculture, showing the quantity and destination of all consignments. Failure to keep such a register, or to produce it when required, or to keep it up to date, and false entries in or fraudulent omissions from such registers, render the manufacturer or dealer liable to a fine not exceeding 10*l.* for the first offence, and 50*l.* for any subsequent offence. An important provision was added to this section by the Grand Committee giving the Board of Agriculture power to enter margarine factories, to inspect any process of manufacture therein, and to take samples for analysis. By Section 9 of the Margarine Act of 1887 margarine manufactories must be registered with the local authority. This section of the present Act extends the provision to the premises of wholesale dealers, and enacts that the registration shall be notified to the Board of Agriculture.

Incidentally it may be remarked that the power of the inspection of factories conferred by this section would appear to make it possible for the Board of Agriculture to issue statistics as to the amount of home-made margarine, which would be valuable as proving whether this was displacing the foreign article and whether the consumption of margarine in this country was decreasing or increasing. The trade and navigation returns given annually in the March number of the Journal show that the imports of margarine have decreased every year since 1893, and a Parliamentary Return obtained during last session (No. 305) gives the names and addresses of margarine manufactories registered under Section 9 of the Act of 1887 ; but unfortunately no official figures are at present available as to the quantity of margarine produced at home.

Amount of Butter-fat in Margarine. (Section 8.)

Section 8 imposes a restriction upon the amount of butter-fat which may be contained in margarine. Henceforth no margarine may be imported or sold the "fat of which contains more than ten per cent. of butter-fat." The object of this provision is to impose an effective check upon the fraudulent sale of margarine mixtures sold as and for the price of genuine butter. There is no demand for mixtures of margarine and butter, as such, and therefore the restriction has no injurious effect upon existing honest traders. On the other hand, the best qualities of margarine are said to always contain a small percentage of butter-fat added in the process of manufacture in the form of milk. The limit of 10 per cent. allows an ample margin for the legitimate manufacture of margarine, and is by many persons considered to be too high.

Other Provisions affecting Produce. (Sections 9–11.)

Section 9 provides, under penalty of a fine not exceeding 2*l.*, for the conspicuous inscription of the owner's name and address upon every vehicle, can, or receptacle from which milk or cream is sold in any highway or place of public resort. Section 10 lays down the procedure for the division of samples of milk, margarine, or margarine-cheese taken in course of delivery; and Section 11 enacts that "every tin or other receptacle containing condensed, separated, or skimmed milk must bear a label clearly visible to the purchaser on which the words "Machine-skimmed Milk," or "Skimmed Milk," as the case may require, are printed in large and legible type. The penalty for contravention of this section is a fine on summary conviction not exceeding 10*l.*

Imprisonment and Fines for Repeated Offences. (*Section* 17.)

The remaining sections of the Act provide mainly for the amendment of the Sale of Food and Drugs Acts of 1875 and 1879 in certain particulars, and also relate to points of legal procedure, such as the effect of invoices and warranties, time limits for the service of summonses, and other technicalities which need not be described. But there is one provision which it is to be hoped may have an important deterrent effect in the prevention of fraud, viz. the power conferred upon the magistrates of inflicting imprisonment without the option of a fine. Such a provision was not in the Bill as originally introduced, although the Select Committee made the principle of imprisonment for repeated offences a strong point in their recommendations. It was necessary to exercise some discretion in connection with this matter, inasmuch as hardships might ensue in cases where, for instance, the offence was committed by unscrupulous salesmen for whose actions the principals were legally responsible and who might be the owners of a number of branch establishments. Yielding, however, to a widely expressed feeling as to the past inefficacy of mere fines, the Grand Committee accepted the principle to which effect has been given by the following carefully drawn enactment in Section 17:

> Where, under any provision of the Sale of Food and Drugs Acts, a person guilty of an offence is liable to a fine exceeding 50*l.*, and the offence in the opinion of the Court was committed by the personal act, default, or culpable negligence of the person accused, that person shall be liable (if the Court is of opinion that a fine will not meet the circumstances of the case) to imprisonment, with or without hard labour, for a period not exceeding three months.

The same section also enacts that in cases where, under the Sale of Food and Drugs Act, 1875, a person may be liable to a fine of the maximum of 20*l.*, he shall be liable for a second offence under the same provision to a fine not exceeding 50*l.*, and for any subsequent offence to a fine not exceeding 100*l.*

The Colouring of Margarine.

The Act is remarkable for one important omission, to which a brief reference may be made. Much disappointment has been expressed that the Act does not give effect to the recommendation of the Select Committee of 1896, and of the Royal Commission on Agricultural Depression in their Final Report of 1897, by prohibiting the artificial colouring of margarine to imitate butter—a prohibition which has long been advocated by many persons as the only effective means of entirely stopping the fraudulent sale of margarine. Without going further into details upon a subject that has recently caused a good deal of controversy, it may be pointed out that foreign governments whose domestic and social legislation is often in advance of our own have many of them either absolutely prohibited or otherwise placed restrictions upon the colouring of margarine. France, Russia, and Italy absolutely forbid colouring to resemble butter. Belgium places discretion as to the nature and the degree of the colouring in the hands of her Minister of Agriculture. In Denmark the margarine must not be of a deeper colour than certain defined shades of yellow; and German margarine must contain a percentage of sesame oil, by means of which the detection of adulteration is readily facilitated.

Reviewing the Act as a whole, there can be little doubt that it is a carefully drawn instrument for the suppression of frauds of which the producer and the consumer have been alike the victims. The provisions as to the proper marking of imported produce, the increased powers of the central authorities, the power to trace wholesale consignments of margarine and margarine-cheese, the statutory limitation of the amount of butter-fat in margarine, and the deterrent effect of a liability to imprisonment are so many additional weapons which the Legislature has placed in the hands of the various authorities whose duty it is to combat dishonest trading. Much, indeed everything, will depend upon the manner in which the Act is carried out. Given a fair amount of intelligence and vigour in its administration, there is no reason why eventually the agricultural and dairy producer should not feel that the keen competition to which he is subjected is for the most part at least honest and legitimate, or why the general public should not have a surer belief that they are consuming the article for which they have asked and paid.

THE RATING OF GLASSHOUSES OVER MARKET GARDENS UNDER THE AGRICULTURAL RATES ACT, 1896.

THE case of Smith and Others (Overseers of the Parish of Worthing) *v.* Richmond (Surveyor of Taxes) has previously formed the subject of two notes in this Journal (3rd series, vol. viii., 1897, p. 770, and vol. ix., 1898, p. 186). On August 3, 1899, the case was finally

disposed of in the House of Lords, before the Lord Chancellor, Lord Watson, Lord MacNaghten, and Lord Morris, who decided that the ground covered by glasshouses in question is not entitled to relief under the Act of 1896. The subjoined report is quoted from *The Times*:—

This was an appeal raising an important question under the Agricultural Rates Act, 1896—viz. whether the ground covered by glasshouses or greenhouses in a market garden is entitled to the benefit of the Act, Section 1 of which makes the occupier of agricultural land in England liable, in the case of every rate to which the Act applies, to pay one-half only of the rate in the pound payable in respect of buildings or other hereditaments. By Section 9 of the Act—"The expression 'agricultural land' means any land used as arable, meadow, or pasture ground only, cottage gardens exceeding one quarter of an acre, market gardens, nursery grounds, orchards, or allotments, but does not include land occupied together with a house as a park, gardens other than as aforesaid, pleasure grounds, or any land kept or preserved mainly or exclusively for purposes of sport or recreation, or land used as a racecourse." The same definition was incorporated with and set out in Article 1 of the Agricultural Rates Order, 1896, issued by the Local Government Board and having statutory effect. The appellants had in the case of certain hereditaments, consisting of land partly covered by glasshouses, inserted the gross estimated rental and rateable value of the whole of such hereditaments under the description of agricultural land. The Assessment Committee, on the objection of the Surveyor of Taxes, decided that land so covered was not entitled to the exemption. The appellants appealed to Quarter Sessions, and on the hearing of the appeal it was agreed, inasmuch as the hereditaments included in the notice of appeal were practically identical in character, to take the hereditament of Robert Piper, numbered 140 in the said notice, as a test case for the purposes of the appeal. With regard to this hereditament the following were the agreed facts:—"The said Robert Piper was a grower of fruit, vegetables, and flowers at Worthing, and described himself, and was commonly known, as a market gardener and nurseryman. He was the owner and occupier of a piece of land rather more than four acres in extent on which *57 glasshouses or greenhouses of various sizes were erected*; the houses were used by the appellant for the purpose of growing tomatoes, cucumbers, and grapes, and to a smaller extent other vegetables for the purpose of sale. The plants and crops grown therein were watered and heated by artificial means, and grown upon soil placed upon prepared beds inside the houses, and matured much earlier than in the open ground. The vines are planted inside the houses, and the roots run partly in the soil under the houses and partly pass through the apertures in the walls into the soil outside. Fifty-one of the glasshouses are thus used for growing vines. In the cucumber-houses (which are six out of the 57 houses) *there are, inside the houses, dwarf brick walls supporting corrugated iron sheets, upon which sheets earth taken*

from the other parts of the nursery ground is placed. In this earth, so placed upon the iron sheets, the cucumber plants are planted. Beneath the iron sheets, and between them and the ground, there are hot-water pipes. *The area actually occupied by the 57 houses is rather more than two acres. The rest (rather more than two acres) consists merely of vine borders, paths, and the stoke-holes. The whole of the houses were built upon dwarf brick walls like an ordinary greenhouse.* (The parts in italics were emphasised by the Lord Chancellor in his judgment.) In the Overseers' statement the property was described as "market gardens and nursery grounds," of the gross estimated rental of 662*l.* 19*s.* 6*d.*, and of the rateable value of 431*l.* 5*s.* It was entered under "agricultural land," and no estimate was given of the buildings and other hereditaments. The Court of Quarter Sessions allowed the appellants' appeal. A case was then submitted to the Divisional Court, which was divided in opinion. Judgment was given on August 2, 1897, by Mr. Justice Collins in favour of the appellants, and by Mr. Justice Ridley for the Crown, represented by the respondents, and the order of Quarter Sessions was affirmed.[1] The respondents appealed, and on March 11, 1898, the Master of the Rolls and Lord Justice Rigby allowed the appeal, Lord Justice Vaughan Williams dissenting.[2]

Mr. Asquith, Q.C., and Mr. Clavell Salter, were for the appellants; the Attorney-General (Sir R. E. Webster, Q.C.), Mr. S. H. Day, and Mr. A. H. Trevor for the respondents. The arguments were heard on March 23 and 24 last, when judgment was reserved.

The *Lord Chancellor*, in moving that the appeal be dismissed, said:

This appeal raises the question what is meant by the words "occupier of agricultural land" in the statute 59 and 60 Vict. c. 16. Apart from the provisions of the statute in question, the word "land" would be variously understood by different persons. To a farmer the word "land" would not mean his farm buildings; to a lawyer the word would include everything that was upon the land, fixed immovably upon it; but the statute has given an interpretation clause and has also in the enacting clause itself pointed out not obscurely with what subject matter it was dealing. The very enacting part of it gives the antithesis between land and buildings, since the relief the occupier is to get is that he is to be liable, in the case of every rate to which the Act applies, "to pay one-half only of the rate in the pound payable in respect of buildings and other hereditaments." Now the special case here finds that "the land" sought to be treated as agricultural land is of the character described in the 14th paragraph of the case as agreed to.

His Lordship stated the agreed facts as above, and continued:

I have emphasised some parts of this description, but it is extraordinary that any claim should be made that what is here described is agricultural land. It would be quite as reasonable to claim that any building, however solid and substantial, used for agricultural purposes was agricultural land,

[1] See Journal R.A.S.E. vol. viii., 1897, p. 770.
[2] *Ibid.* vol. ix., 1898, p. 186.

because to a lawyer land would include it, and as its use was agricultural, it therefore became agricultural land within the meaning of the Act. I agree with the Master of the Rolls that the term "land and buildings" in this Act are mutually exclusive of each other. I must say I feel no difficulty in applying the interpretation clause to the construction of the Act, which seems so plain. A market garden or a nursery ground may, as part of it, have agricultural land, and if such part is used as arable, meadow, or pasture ground only it will not forfeit its claim to relief because it forms part of such an industry. But in what sense can these buildings be described as arable, meadow, or pasture? They are buildings, and not agricultural land at all. I am very clearly of opinion that this appeal ought to be dismissed with costs, and I move your Lordships accordingly.

Lord Watson—

I have done my best to examine the statute in question, and I have been quite unable to arrive at any result other than that which is embodied in the judgment appealed from. I agree with all the observations of the Master of the Rolls and with the brief but cogent reasoning of my noble and learned friend on the Woolsack.

Lord MacNaghten and *Lord Morris* concurred.

THE AUTUMN OF 1899.

THE weather of last autumn was of a rather changeable character. As a rule the conditions were fair and dry, but at intervals the weather broke up completely, the rainfall at these times being unusually heavy, especially in the eastern and southern districts. Thunderstorms were very frequent in September, and a considerable amount of fog and mist prevailed between October 18 and 24, and also during the latter half of November.

With the exception of a brief thundery period between the 5th and 7th, the early part of September was mostly fair, with temperatures well above the average. Towards the latter part of the month, however, there was a gradual deterioration, the weather ultimately becoming stormy, changeable, and cool. This state of things appears to have culminated between September 29 and October 1, when very heavy rains occurred in nearly all parts of the country, with severe thunderstorms in places. On the afternoon of October 1, a whirlwind was experienced in some portions of Berkshire, Wiltshire, and North Hants. After about the 4th of the month a decided improvement set in, and although a short spell of showery weather was experienced between the 10th and 12th the conditions were otherwise fair and dry until very nearly the close of the month, the third week being distinguished by fine warm days, but cold foggy nights, with sharp frosts in most of the inland districts. After the 25th, however, the weather again broke up entirely, and from this time onward to about November 11 the atmosphere was extremely rough and unsettled, strong southerly and south-westerly gales being experienced over nearly the whole

kingdom on November 3 and 4, and again on the 7th and 8th. On the 10th another gale occurred, but this time from points between west and north-west. The rainfall during the whole of this period was extremely heavy, more especially on October 26 and 27, and on November 3, 5, and 7, most of the larger falls being reported at places in the south and east of England. After November 11 the weather again cleared up, and with the exception of slight showers between the 18th and 20th the remainder of the month was chiefly fair and dry, with however a considerable amount of fog or mist in places. The winds were at first rather variable, and although the day temperatures were fairly high, the nights were cold, with sharp frosts between the 18th and 20th. Later on, however, a gentle breeze from south-west and west set in over the whole country, and the weather became unusually mild for the time of year, no further night frost being experienced until quite the close of the month.

The leading features in the weather of last autumn are shown in a statistical form on p. 764, the following remarks giving further details of interest in the history of each particular element.

Temperature.—Between the middle of September and the middle of October the mean temperature was below the average, the deficiency of warmth being, however, very slight in the early part of the period. At other times there was an excess of heat, this being especially the case at the beginning of September and the beginning and end of November. Taking the season as a whole, the mean temperature was above the average, the excess varying between a degree and a degree and a half over our northern, eastern, and midland counties, but amounting to nearly two degrees in the southern and south-western districts, and to more than two degrees in the Channel Islands. A further analysis shows that the excess of warmth was much greater in the daytime than at night, this being especially the case in the northern, eastern, and central parts of the country; in the north-east of England the night temperatures were, in fact, very little above the normal. Comparing the past autumn with those of recent years, we see that over the country generally it was not nearly so warm as that of 1898, but that it differed little from those of 1897 and 1895. It was, however, warmer than that of 1894, and much warmer than that of 1896. The highest temperatures of last autumn were registered early in September,—mostly on the 5th, when the thermometer rose to 80° and upwards in all but the northern districts and the Channel Islands, and to 85° and upwards in many parts of the eastern, midland, and southern counties. The highest reading of all was attained in London, where the thermometer on the 5th rose to 89°, this being with two exceptions the highest September temperature observed in the metropolis for nearly sixty years past. In 1898 the thermometer on the 8th of the month rose to 91°, while in 1868, on the 7th, it reached a maximum of 92°. In all parts of the country the highest autumn temperatures were lower than those of 1898, though much higher than those of the two preceding years. The lowest temperatures of the past season were observed, as a rule,

Temperature, Rainfall, ***and*** **Bright Sunshine** ***experienced over*** **England** *and* **Wales** ***during the Thirteen Weeks ended December* 2, 1899.**

(The Autumn Season.)

Districts	Temperature: Highest observed	Temperature: Lowest observed	Day temperatures: Mean	Day temperatures: Difference from average	Night temperatures: Mean	Night temperatures: Difference from average	Day and night temperatures combined: Mean	Day and night temperatures combined: Difference from average
	°	°	°	°	°	°	°	°
North-eastern counties	79	27	56·4	+2·7	43·3	+0·2	49·9	+1·5
Eastern counties	88	27	57·8	+1·8	43·4	+0·8	50·6	+1·3
Midland "	86	22	57·2	+1·8	42·1	+0·5	49·7	+1·2
Southern "	89	29	59·3	+2·2	46·0	+1·5	52·7	+1·9
North-western counties, including North Wales	76	24	56·3	+1·6	45·0	+0·6	50·7	+1·1
South-western counties, including South Wales	84	22	58·6	+2·3	46·8	+1·6	52·7	+1·9
Channel Islands	79	39	60·9	+2·9	51·5	+1·6	56·2	+2·2

Districts	Rainfall: Days with rain: Number	Rainfall: Days with rain: Difference from average	Rainfall: Total fall: Amount	Rainfall: Total fall: Proportion of average amount	Bright Sunshine: Duration: Hours recorded	Bright Sunshine: Duration: Difference from average	Bright Sunshine: Percentage of possible amount: Percentage	Bright Sunshine: Percentage of possible amount: Difference from average percentage
			ins.	per cent.				
North-eastern counties	38	−14	6·0	75	298	+50	32	+5
Eastern counties	38	−13	7·8	99	373	+43	40	+5
Midland "	36	−14	7·9	94	308	+32	33	+4
Southern "	33	−16	9·5	101	389	+51	41	+5
North-western counties, including North Wales	48	−6	11·0	96	304	+48	32	+5
South-western counties, including South Wales	44	−12	10·2	78	348	+17	37	+2
Channel Islands	41	−20	7·8	68	410	+29	43	+3

NOTE.—The above Table is compiled from information given in the Weekly Weather Report of the Meteorological Office. The averages employed are: For Temperature, the records made during the twenty-five years, 1871–95; for Rainy Days, the values for the fifteen years, 1881–95; for Total Rainfall, those for the thirty years, 1866–95; and for Bright Sunshine, those for the fifteen years, 1881–95.

between November 18 and 20, when sharp frost occurred in all the inland districts. In the shelter of the screen the thermometer in many places fell more than five degrees below the freezing point, the lowest readings of which we have at present any account being at Stamford and Llandovery (Carmarthenshire), where a minimum of 22° was registered. On the surface of the grass the frost was more intense, an exposed thermometer at Oxford registering as low as 20°, or twelve degrees of frost. The only other frost of any consequence occurred on or about October 15, when the sheltered thermometer fell to five or six degrees below freezing point in some parts of our northern, eastern, and midland counties. A comparison with the records for previous years shows that the lowest autumn temperatures differed very little from those of 1897 and 1898, or of 1894. The frosts were at no time so severe as those experienced in the autumns of 1895 and 1896.

Rainfall.—So far as rainfall was concerned the past autumn was a season of extremes, the weather being as a rule either very wet or very dry, and that sometimes for many days together. The rainiest spells occurred at the end of September and the beginning of October, and at the end of October and the beginning of November; the driest periods occurring during the third week in October and the latter half of November. In London the total rainfall during the first nine days of November amounted to nearly $4\frac{1}{4}$ inches and was nearly 2 inches more than the average for the whole month. After the 11th not a drop fell, so that while as regards total fall the month was one of the wettest Novembers on record, it was, as regards prolonged absence of rain, one of the driest. Taking the autumn as a whole, the rainfall varied considerably in different parts of the country. In the eastern and southern counties it agreed very closely with the normal, but in other districts there was a deficiency—slight in the midland and north-western counties, but large in the north-eastern and also in the south-western district and the Channel Islands. In the north-east the amount was only three-fourths, while in the Channel Islands it was little more than two-thirds of the average. The number of days on which rain fell was in nearly all cases extremely small, the deficiency in this respect being nearly as marked in districts, such as the eastern and southern, where the total quantity of rain was practically normal, as in other districts where, owing to the smallness of the total, a low frequency might naturally have been expected. Over the country generally the autumn was wetter than those of 1898 and 1895, and much wetter than that of 1897; it was, however, drier than those of 1894 and 1896. During the twelve months ending November the total rainfall was less than the average in all but the north-western counties, where the amount was a trifle in excess of the normal. In the south-west the deficiency was not large, but in other districts the total amount was at least 12 per cent. less than the average, and in the Channel Islands as much as 15 per cent. less. In the western parts of the country the quantity was very similar to that recorded in 1898, but in other districts the deficiency was not so large, this remark applying more especially to the east and south, where the

total amount in 1898 was little more than three-fourths of the normal. The driest season by far of the past year was the summer, and next to that the autumn. During the winter and spring months the rainfall was in most districts in excess of the average. The past autumn was distinguished by many individual falls of rain of great weight, the most important cases occurring: (1) On September 6 and 7 in the south and east of England, when over an inch was registered in many places. In London, during a brief thunderstorm on the 6th, an inch of rain fell in the space of half an hour, and at Cirencester on the following day rather more than an inch in an hour. (2) In the same districts on September 29, when amounts ranging between 1 and $1\frac{1}{3}$ inch were recorded in many places. (3) On October 1, in many parts of the country, and especially in the north and east, nearly $1\frac{3}{4}$ inch being measured at Rothamsted. (4) On October 26 and 27, and again in the south and east, the total amount for the two days being over $1\frac{3}{4}$ inch at Arlington (North Devon) and Plymouth. (5) On November 3, when more than an inch was measured in several places, and as much as 2·1 inches at Haslemere and 1·8 inch at Southampton. (6) On November 5, and again principally in the southern and eastern districts, the amount being as large as 2·2 inches at Burgess Hill, Sussex, and 1·6 inch at Cranleigh (Surrey). (7) On November 7, in many places, but with no falls greatly exceeding an inch. (8) On November 9, and mainly in the south-western and western districts. In the first three cases the heavy rains were accompanied by thundery weather, although in some instances the electrical disturbance was not apparent in the actual places where the downpour occurred. There was during the whole autumn no record of snow or sleet in any of the English districts.

Bright Sunshine.—In eight weeks out of the thirteen the duration of sunshine over the country generally was more than the average, the excess being very large in the second and third weeks of October. In the first of these cases the duration was the largest experienced at so late a time in the season since at least the year 1881, when sunshine recorders first came into general use. The weeks with a deficiency in the amount were those ending September 16 and 30, October 7 and 21, and November 25, but in some of these cases the deficiency was not general over the whole country. Taking the season as a whole, the amount of sunshine was above the average, the excess being mostly large, but rather small, singularly enough, in two of the districts having a considerable deficiency of rain, viz., the south-west of England and the Channel Islands. A comparison with previous autumns yields very different results in different parts of the country. In the midland and southern counties the amount this year was about the same as last—larger than in 1896 or 1897, but smaller than in 1895. In the south-western district and the Channel Islands the autumn was not nearly so sunny as that of 1898, but in the two northern districts it was far sunnier, the duration in the north-eastern counties being in fact the largest recorded since the autumn of 1895

THE DESTRUCTION OF CHARLOCK.

CONSIDERABLE attention has recently been directed to the possibility of getting rid of the troublesome weed "charlock" by the use of spraying solutions of sulphate of copper and sulphate of iron.

The suggestion to use these solutions emanated about two years ago from France, and already last year experimental trials were made in England in the counties of Northumberland, Lancashire, and Essex. These, seeming to promise success ultimately, were repeated during the past season, and much more extensively than before.

It has been thought well to endeavour to gather together the results obtained, and to draw from them some general conclusions as to the utility or otherwise of the methods suggested, and the conditions which govern the successful application of them.

In several of the cases recorded the results have already been published in the form of separate reports, in others the particulars have been kindly sent me by the experimenters, whose assistance I would wish here to acknowledge.

The experiments of 1898 were continued in 1899, (1) in Northumberland and adjoining northern counties by Dr. Somerville, and (2) in Essex by Mr. T. S. Dymond, while (3) Mr. J. R. Campbell's transference to the Yorkshire College, Leeds, caused the experiments of 1899 to be conducted by him in the East and West Ridings of Yorkshire.

In addition, I have received particulars of (4) the Cambridge and Counties experiments under Mr. T. B. Wood, of Cambridge University, (5) those at the Agricultural College, Uckfield, Sussex, under Mr. W. J. Malden, (6) experiments at the South-Eastern Agricultural College, Wye, Kent, under Mr. H. H. Cousins, and (7) those at the Cheshire Agricultural and Horticultural School, Holmes Chapel, under Mr. Jas. S. Gordon. Further, there are the results of an inquiry made by Mr. G. F. Strawson from some 200 persons in different parts of the country who had made trials with sulphate of copper as a spraying material for charlock; and, lastly, a set of experiments by Mr. James Hornsby, of Laxton Park, Stamford, conducted under the direction of the Royal Agricultural Society of England, and with the assistance of Mr. Carruthers, the Society's Botanist, and Mr. J. J. Forrester, the manager of the Society's Experimental Farm at Woburn. Each of these will be briefly noted in turn.

1. *Northumberland and adjacent counties* (Dr. Somerville).—Dr. Somerville reports as to these that experiments were conducted during the past summer at 17 different farms in the northern counties, solutions of sulphate of copper and sulphate of iron in varying strengths and quantities being employed, and he gives his opinion decidedly that the use of 40 gallons per acre of a 4 per cent. solution of sulphate of copper can be recommended as a thoroughly

satisfactory dressing for destroying charlock without doing any injury to the corn or other crop among which it grows. If a weaker solution than this be employed, Dr. Somerville thinks it will generally prove unsatisfactory, unless the application be repeated a week or ten days after the first dressing.

[It may be here mentioned, for convenience sake, that a 4 per cent. strength solution of sulphate of copper &c. means 4 lb. of sulphate of copper &c. dissolved in 10 gallons (*i.e.* 100 lb., a gallon of water weighing 10 lb.) of water. To get 40 gallons of a 4 per cent. solution, therefore, one would require to take 16 lb. of sulphate of copper and dissolve this in 40 gallons of water, and this would be (according to the Northumberland experiments) the quantity to use for dressing one acre. The cost of the actual materials, with sulphate of copper at 28*s.* per cwt., would be about 4*s.* A 2 per cent. solution would similarly mean 2 lb. dissolved in 10 gallons of water, or, if applied at the rate of 40 gallons per acre, 8 lb. of sulphate of copper to 40 gallons of water, and the cost one-half the foregoing, viz. 2*s.*]

2. *Essex* (Mr. T. S. Dymond).—The report of these experiments has not yet been published, but Mr. Dymond tells me that the conclusions of 1898 have been in every particular borne out by the further ones of 1899. The general conclusions of 1898 were that a 2 per cent. solution of sulphate of copper, if applied at the rate of from 25 to 50 gallons per acre, during dry weather, and when the charlock plant is still quite young, will be quite effectual in destroying it without injury to the corn or other crop.

Mr. Dymond has kindly furnished me with the following general conclusions from his new experiments of 1899, the account of which, as mentioned, has not been yet published, but will shortly appear in Mr. Dymond's report to the Essex Technical Instruction Committee. These conclusions are put out so concisely that I cannot do better than give them almost in Mr. Dymond's own words.

1. Sulphate of copper and sulphate of iron are equally efficacious on the charlock, nor is the one more injurious to the crop than the other. Sulphate of iron is cheaper, but a stronger solution is required, so that the cost of the spraying liquid is about the same in the two cases. Sulphate of iron is, however, a far more unpleasant substance to handle, and the use of sulphate of copper is therefore recommended and alone referred to in the following particulars.

2. Charlock was sprayed in the following crops, with the effect on the crop as stated:

Wheat, oats, barley .	Uninjured.
Young peas . . .	Not permanently injured.
Peas in bloom . .	Uninjured (bloom untouched).
Cabbages . . .	Uninjured.
Turnips . . .	Killed almost as quickly as charlock.
Mangels . . .	Not permanently injured.
Young clover (in corn) .	Absolutely uninjured.
Beans	Not permanently injured.
Tares	Uninjured.

3. A 1 per cent. solution of sulphate of copper is too weak to kill the charlock; a 6 per cent. solution is strong enough to injure the crop and retard its growth; a 2 per cent. solution is strong enough in most cases to kill the charlock, whether in the smooth leaf or in the rough leaf stage. In certain seasons, however, if the charlock is growing very rapidly, a $2\frac{1}{2}$ or 3 per cent. solution may be required, *or* a second application of the 2 per cent. solution may be used, and this will be fatal to the already weakened plant. It has been noticed that even when the sprayed charlock was not killed, it failed to produce an appreciable quantity of seed. Although the treatment can be successfully applied up to the period of blooming, it is recommended to spray as soon as most of the charlock is above the ground.

4. Every leaf of the charlock must receive spots of liquid, and, to ensure success, the leaves should be well wetted with the liquid. For this purpose 25 to 50 gallons per acre will be required, depending on the size of the plant and the kind of spray used.

5. It is impossible to apply the spray regularly in windy weather. A shower of rain falling within four or five hours of the spraying will wash the liquid off the leaves before it has been absorbed, or rather has blackened the leaf, and the charlock will be uninjured. As a rule, it is best applied in the early morning when the dew is on the leaf, as the solution then becomes better distributed. In a hot sun, the solution dries on the leaf too quickly to be absorbed.

6. The solution is most easily prepared by stirring up the *powdered* sulphate of copper in a *wooden* pail with successive quantities of cold water, and pouring the liquid into a receiver and making it up with water to the necessary volume. The powdered sulphate of copper should be purchased ready weighed out in 5 lb. bags (enough for 25 gallons), or measured out of the barrel with a pint or half-pint measure. A half-pint measure holds enough for a three gallon knapsack sprayer. On no account must a zinc or iron pail be used for mixing. Soft water is much preferable to hard.

7. No satisfactory explanation of the effect of sulphate of copper on charlock has yet been adduced. It has nothing to do with the roughness of the leaf, for even in the smooth leaf stage the charlock is equally injured. By no chemical tests has it been possible to identify the presence of copper in the stem or roots of charlock plants killed by sulphate of copper spraying.

8. No other weeds are so injured by sulphate of copper. Thistles are blackened and withered but not killed. White charlock (a wild radish), a still more troublesome weed on soils deficient in lime, is killed by a somewhat stronger solution, especially if applied twice, but the process is not considered a success for its destruction.

Mr. Dymond proceeds to mention that other solutions that have been advocated have been tried, nitrate of soda and sulphate of ammonia among others being unsuccessful, while dilute acids and caustic alkalies killed the corn as well as the charlock.

He also goes into the question of the kind of machine to use, advocating the "knapsack" sprayer with double spray for small

areas, but for larger ones a Strawson's cart sprayer, taking three drills at a time.

Mr. Dymond concludes by describing the method of charlock destruction in field crops as an "undoubted success," and he believes that where failure or partial success only has been the result, this is traceable to neglect of some of the instructions.

3. *Yorkshire College, Leeds* (Mr. J. R. Campbell).—[Taken from Report on the Spraying of Charlock and Runch, 1899. Yorkshire College and East and West Ridings Joint Agricultural Council.]

Mr. Campbell's experiments in Lancashire in 1898 were mainly on the use of sulphate of iron as a spraying material, and a 10 per cent. strength solution was found, in the case of charlock among an oat crop, to be perhaps the most successful dressing.

In 1899 sulphate of iron was again the material mostly experimented with, and though sulphate of copper was tried in a few instances, the sulphate of iron dressings were the more successful. This is somewhat remarkable, as other experiments, almost without exception, indicate sulphate of copper to be the more satisfactory of the two, sulphate of iron in some cases (see Mr. Hornsby's experiments, p. 773) having even proved quite useless. Sulphate of iron is by far the cheaper material, but when used in the strengths and quantities advocated, the difference of cost between an ordinary dressing of sulphate of copper and one of sulphate of iron is not material.

Experiments were carried out at twenty-two different places in Yorkshire, the crops being barley, oats, spring wheat, and young seeds. Solutions of sulphate of iron of strengths varying from 6 to 16 per cent., in quantities of 35 to 40 gallons per acre, and of sulphate of copper 2 to 3½ per cent. strength, also at 35 to 40 gallons per acre, were tried, and the best results were obtained with 12, 14, and 16 per cent. sulphate of iron solutions at the rate of 40 gallons per acre. Out of the twenty-two trials only two showed no success, in nine cases the charlock was killed when a strong solution was used or a second dressing of a weaker one was given, and in nine other cases the growth of the charlock was distinctly checked. There was, as a result, no deficiency in either quantity or quality of the grain, nor harm to young seeds.

As in other experiments recorded, there is no return given of the actual yield of grain, straw, &c. on the sprayed plots as against that of the unsprayed, a comparison which ought really to be made, unless it is to be supposed that the virtue of the spraying consists merely in preventing the appearance of the charlock in the succeeding crop.

Mr. Campbell rightly draws attention to the important consideration of the character of the weather at the time of application, dry calm conditions being essential, a wet or windy day causing the dressing to get on the corn &c. and not to reach the charlock properly. The age of the charlock, he also points out, is an important factor, as it ought to be dressed when it is in rough leaf, and before flowering, the barley &c. being about 3 inches high. When charlock is fully grown, the extent of its destruction will vary with the

strength of solution employed, but seed will still be produced. On the whole, Mr. Campbell recommends a second dressing following the first, and, as regards method of application, he prefers Strawson's machine with a separate pumping arrangement to fill the barrel in the cart from a mixing barrel on the ground, and so avoiding the filling in by hand buckets. This would add 5*l.* 11*s.* to the cost.

Mr. Campbell is of opinion that the cause of the charlock being killed and not the corn, is not the roughness of the charlock leaves arresting the spraying material, but that cruciferous plants must contain some peculiar constituents which react chemically to the sulphates of iron and copper.

4. *Cambridge and Counties* (Mr. T. B. Wood).—[Report to Cambridge and Counties Agricultural Scheme.]

Only sulphate of copper has been tried, and in strengths of 2 to 4 per cent. The application most generally successful has been that of 40 gallons per acre of a 3 per cent. solution. In a few cases the corn crop was slightly discoloured at first, but there was no permanent injury whatever. Here, again, no weights of corn crops are given. Barley and oats were the crops in question. Of nine experiments on six farms in Cambridgeshire and Hunts, in three of them the charlock was entirely killed, in three others the growth was checked, in other two all the youngest plants were killed, and in only one case was there a little injury done. In fifteen experiments on eight farms in Northants and Suffolk there was no real failure and two complete successes, while in five cases the charlock was badly scorched and in five instances the growth was checked. Lastly, on fourteen farms in Herts there was complete destruction of charlock in two instances, partial destruction in ten, and almost total failure in two cases.

The Éclair (knapsack) distributor was used, and also a larger sprayer for attachment to a cart, designed by Mr. Atterbury, of the University Department of Agriculture. This is an ingenious arrangement and is worked automatically by gearing from the cart-wheel, the labour of hand-pumping being thus avoided. The entire cost is below 15*l.*

5. *Agricultural College, Uckfield, Sussex* (Mr. W. J. Malden).—[Professional Notes of the Surveyors' Institution.]

Mr. Malden experimented with sulphate of iron of strengths from 2 to $7\frac{1}{2}$ per cent., and with sulphate of copper of 1 to 4 per cent. strength, the crops being oats, tares, beans, grasses, and clovers. His experience was in favour of sulphate of copper, and that the stronger solutions were not better than the weak ones. The latter browned the crops at first, but this passed off, while a 4 per cent. solution of sulphate of copper and a $7\frac{1}{2}$ per cent. solution of sulphate of iron, each applied at the rate of 50 gallons per acre, hurt the corn crop. So small a quantity as 25 gallons per acre could not be properly distributed, and the best, on the whole, was 50 gallons per acre of a 2 per cent. solution of sulphate of copper. After such an application Mr. Malden found there to be only 1 seed of charlock in the harvested crop on the sprayed plot to 61·6 on the unsprayed.

The charlock should be sprayed in the early stages, and frosty weather at the time of application should be avoided. On grasses and clovers a 1 per cent. solution of sulphate of copper could be used without risk.

Mr. Malden works out in detail the practical cost of an application of 50 gallons per acre of a 2 per cent. sulphate of copper dressing (*i.e.* 10 lb. sulphate of copper to 50 gallons of water) as follows:

	s.	d.
2 men and 2 horses at 3*s*. each, and 1 boy at 1*s*. = 13*s*., or 5*d*. on 30 acres		5
10 lb. sulphate of copper at 3*d*.	2	6
Wear and tear of machine		1
Total cost per acre	3	0

Thirty acres, he reckons, could be done per day, and the cost of the machine is 8*l*.

6. *South-Eastern Agricultural College, Wye, Kent* (Mr. H. H. Cousins).—The experiments conducted here form a striking contrast to the others recorded, for Mr. Cousins does not hesitate to say that the various solutions tried—among which were copper, iron, and arsenic salts, sulphuric acid, sulphate of ammonia, and gas liquor—all injured the barley crop while not killing 10 per cent. of the charlock, and he warns farmers not to be too ready to accept without reservation the statements put forward as to the success of the spraying method. Such a warning is, no doubt, timely, and certainly it does not do to regard success as definitely proved yet. Still, in the face of the testimony given by capable observers such as those mentioned here, one can hardly help concluding that there is more than an element of success in the method, and that there must have been exceptional circumstances present in the case of the Wye College experiments to make the results so unsatisfactory. What those exact conditions were, it is hard to say. I should be inclined to think, myself, that the fact of the applications not being made earlier than May 24 and June 1, in a part of the country so far south as Wye, had to do with the non-success.

7. *Cheshire Agricultural and Horticultural School, Holmes Chapel* (Mr. James S. Gordon).

In these experiments (as recorded in a leaflet issued by the Cheshire County Council) sulphate of iron of strengths varying from $7\frac{1}{2}$ to 15 per cent. at the rate of 40 gallons per acre (cost of materials, 10*d*. to 1*s*. 8*d*.), and sulphate of copper of 1, 2, 3, 4, and 5 per cent. strength in quantities of 30 to 40 gallons per acre (cost of materials, 1*s*. to 3*s*. 9*d*.), were employed on an oat crop badly infested with charlock, the applications being made on May 31, when the charlock was six inches high and had flower heads. The experience was that only the stronger solutions did good, and that as much as 40 gallons per acre ought to be used. A $12\frac{1}{2}$ per cent. solution of sulphate of iron, or a 4 per cent. solution of sulphate of copper, did well. The yield of grain and straw (though the weights are not

given) was stated to be better on the sprayed than on the unsprayed plots, and at harvest time there was very little charlock on the former and very little charlock seed on the ground, whereas on the unsprayed plots charlock plants were thick and the seed much scattered on the ground. The stronger applications blackened the oats at first, but they then recovered.

Mr. Gordon advocates the application of a second dressing about ten days after the first one, as the charlock is likely to grow again. It must be remembered, however, that in these experiments the charlock was rather too far grown when the spraying was first done.

8. *Mr. G. F. Strawson's statistics.*—Out of some 200 trials throughout the country with a 2 per cent. solution of sulphate of copper at the rate of from 40 to 56 gallons (say 50 gallons as a rule), 68 per cent. are reported as having proved the application to be successful, 26 per cent. are returned as "partially successful," and 6 per cent. only as "failures." Where the charlock was already old not one-half of it was destroyed, and when in an advanced stage the results were not equal to those with quite young charlock.

9. *Laxton Park, Stamford* (Mr. James Hornsby).—Mr. Hornsby, as stated, had, in the carrying out of these experiments, the co-operation of the Royal Agricultural Society, and the personal assistance of Mr. Forrester, the manager of the Woburn Experimental Farm, while the Society's Consulting Botanist, Mr. Carruthers, also reported on the appearances shown. Mr. Hornsby has himself issued, as a separate sheet, the account of the experiments, the general points of which it is only necessary here to deal with. Barley was the crop mainly tried, and also oats and red clover. Sulphate of copper and sulphate of iron were the solutions used, the former of 2, 3, 4, and 5 per cent. strengths at 20 to 40 gallons per acre, and the sulphate of iron of $7\frac{1}{2}$ to 10 per cent. strengths at 32 to 40 gallons per acre. A "knapsack" distributor was used. The barley was temporarily injured by the heavier applications, but recovered, while 30 gallons of a 2 per cent. solution of sulphate of copper was found enough to kill all the charlock when present in moderate amount, though when charlock was very thick 32 gallons of a 5 per cent. solution were required. As little as 16 gallons per acre was found to be insufficient, not killing more than the quite young plants. Sulphate of iron as a spraying material was useless in each case. Mr. Hornsby found that a $2\frac{1}{2}$ per cent. solution of sulphate of copper at the rate of 40 gallons per acre did not injure red clover at all. Tried upon an oat crop, when charlock was in full flower, 35 gallons of a 4 per cent. solution of sulphate of copper killed one-half of the charlock. When applied to charlock quite young 85 per cent. of it may be reckoned to have been destroyed. Mr. Carruthers, after visiting the experiments, reported as follows :—

"In the recent visit to Laxton Park an opportunity was given to observe the results of Mr. Hornsby's experiments with copper sulphate on charlock. He had recently taken over a farm which had been allowed to get into a foul condition. One field sown with

barley and clover had a great deal of charlock everywhere in it, and in some places in the field it was the predominant crop. Mr. Hornsby selected this field for trial and sprayed several plots. The charlock was in pod and the yellow flowers were still expanding. He sprayed with a 4 per cent. solution. The result was that every charlock plant was so completely killed down to the crown of the root that no food was conveyed through the stem to the seed pods —flowers, pods, foliage, and stem were all destroyed. In a very few cases the roots still remained alive, and a new branch had been sent out from the crown after the copper sulphate had done its work on the rest of the plant. The vegetation on the plots was otherwise not in the least affected. The barley was not less vigorous. The weeds were not touched by it. Chickweed, pansy, and bindweed were unharmed. Even the tender young clover was not in the least affected by the spray. Indeed, the clover was rather more vigorous in the sprayed plot than in the surrounding field, for the killing the charlock had given air and light to the vegetation which was previously choked by that weed. I have not been able to detect anything in the structure of the charlock that should make it so readily a prey to the copper sulphate. The selection of the charlock for destruction is still more remarkable when we find that it does not in the least injure another species of the same genus, which in Cumberland is known as the 'smooth-leaved charlock.' This plant, the *Brassica campestris* of Linnæus, is very common in some districts. A correspondent in Cornwall writes that it is very common in his county. He has observed that, while the common charlock is easily destroyed by copper sulphate, the smooth-leaved plant is quite uninjured by it. This is probably the explanation of the difference in the testimonies as to the influence of copper sulphate on charlock. The two plants so closely resemble each other that only a careful observer can distinguish that they differ. The true charlock (*Brassica sinapistrum*, Boiss.) is destroyed by treatment, while the smooth-leaved charlock (*Brassica campestris*, Linn.) is not affected."

As the general outcome of Mr. Hornsby's experiments, it would seem that for charlock when still young 40 gallons per acre of 2 per cent. solution of sulphate of copper would be found effectual, but that if the charlock be already in flower as much as 60 gallons of a 4 per cent. solution would be required.

Mr. Hornsby points out that the cost of such an application would be only about 4*s.* per acre, while it would cost from 30*s.* to 35*s.* an acre to hand-pull the charlock, and, moreover, a quantity of clover would be pulled up along with the charlock.

Summary.

A review of the preceding account of experiments conducted in different parts of the country will lead to the following general conclusions.

1. It can hardly be doubted that suitable spraying solutions

when applied under proper conditions, are capable of destroying charlock to a very great extent when it occurs in corn and other crops, without the crop itself being injured.

All the experiments recorded, with the exception of those at Wye College, bear out this general conclusion, though it is clear that much is still to be learnt as regards the influence of the conditions that prevail at the time of application of the dressing.

2. Of spraying solutions, sulphate of copper is, on the whole, the best. Sulphate of iron is more uncertain, more unpleasant to use, and, though cheaper in cost, requires to be used in so much larger quantity than sulphate of copper, that the cost comes in either case to about the same.

In the Essex experiments sulphate of iron of 12 per cent. strength and sulphate of copper of 2 per cent. strength did about equally well. In the Uckfield experiments sulphate of copper was the better, and in Mr. Hornsby's experiments sulphate of iron was quite useless. In the Yorkshire experiments alone was sulphate of iron preferred, but sulphate of copper was not given nearly such an extended trial.

3. Successful spraying depends largely upon the conditions prevailing at the time of application. These are mainly: (*a*) the state of the weather, and (*b*) the age of the charlock. The weather should be dry and calm, and not wet, windy, or even frosty. If rain follows soon after application, respraying may be necessitated. All the experiments point to the conclusion that charlock ought to be sprayed in quite the early stages, and before the flower-heads appear. Its destruction, or at least check, even in the later stages, and when flowering has taken place, is, however, not hopeless if stronger solutions and larger quantities be employed.

4. As regards strength and quantity of solution to employ, considerable variety of opinion exists, but it would appear that it is not desirable to use less than 40 gallons per acre, and that, while a 2 per cent. solution of sulphate of copper will, as a rule, be successful in destroying charlock when in the quite young stage, a 3 per cent., or even 4 per cent., solution may be needed if the charlock be more advanced, or be specially thick on the ground.

5. As regards method of application, a knapsack sprayer costing 30*s.* will serve for quite small areas, but for larger areas a barrel, with spraying appliances, must be mounted in a cart; such a machine would cost about 8*l.*, or, with automatic action to avoid hand-pumping, about 15*l.* From 20 to 30 acres, according to the land, could be sprayed in a day, and the cost of materials and application would be from 3*s.* to 4*s.* per acre.

6. Nothing is definitely known as to why charlock should be destroyed by salts of copper and iron, but the hitherto accepted theory that the roughness of the charlock leaves is the influencing cause, seems to be disproved.

J. AUGUSTUS VOELCKER.

13 Hanover Square, W.

THE GEOLOGICAL SURVEY OF ENGLAND AND WALES.[1]

THE following extracts from the Summary of Progress of the Geological Survey for 1897, by the Director-General (Sir Archibald Geikie, LL.D., F.R.S.), are such as relate to matters of agricultural or other economic interest.

OLD RED SANDSTONE.

South Wales.—During the re-survey of the South Wales coal-field it has been necessary to map the underlying formations which come into the areas contained within the sheets of the coalfield map. In the course of this revision further progress was made with the tracing of the Old Red Sandstone. A small area occupied by this formation in the Ely Valley, in the county of Glamorgan, was found by Mr. Cantrill to consist of red sandstones and quartz-conglomerates, which produce well-marked features west of Groes-faen and along the elevated grounds of Hensol Park. The strata exposed all belong to the higher part of the system.

The escarpment formed by the Old Red Sandstone on the north side of the coalfield, which reaches a height of 2,906 feet in the Brecknock Beacons, falls partly within the area of Sheet 231, and has been examined by Mr. Cantrill. The lowest beds exposed within the area are well displayed at the heads of Glyn Tarell, Glyn Senni, and the Dringarth Valley. They consist of rapid alternations of red and green sandstones, shales, and marls, with numerous thin red and green cornstones, usually two or three feet thick, and consisting of a mass of small rounded fragments of limestone in a sandy and calcareous matrix. Pebbles of quartz and sandstone also occur in these calcareous bands, and sometimes the limestone pebbles diminish in number until the rock becomes a calcareous pebbly sandstone. In the Dringarth Valley, where these strata occur as an inlier, there are exposed also some grey and black shales with indefinite traces of plants. The colour of these cornstone-bearing rocks varies rapidly, and in Glyn Senni some of the cascades exhibit a thick green series. Micaceous flaggy green sandstones have been worked near Blaen Senni for roofing, paving, and tombstones.

These strata pass upwards into a great thickness of alternating red sandstones, shales, and marls, with occasional beds of massive coarse sandstone, frequently false-bedded, and containing quartz-pebbles. Regarded in a broad aspect, the series may perhaps be said to be characterised by massive coarse sandstones in the lower part, thick marls with sandstones in the middle, and hard brick-red sandstones and marls in the upper parts. Traces of cornstones

[1] The work of the Geological Survey was described in this Journal, 3rd series, vol. v., 1894, pp. 140–162.

occur even in the uppermost beds. The hard sandstones of the upper parts give rise to the characteristic feature of this Old Red Sandstone tract—namely, long gently inclined plateaux, bounded by precipitous crags, which lead up to the escarpment. The Brecknock Beacons consist of these red sandstones up to their summits, unlike the more prominent hills in Monmouthshire, all of which are capped by the uppermost conglomeratic subdivision of the Old Red Sandstone.

Triassic (and Rhætic).

North Staffordshire.—In the course of the revision of the North Staffordshire coalfield it has been necessary to retrace some of the areas of Triassic rocks. In regard to this part of the field-work Mr. De Rance reports as follows:—No Lower Mottled Sandstone occurs in North Staffordshire, the Pebble Beds of the Bunter resting on the denuded edges of all members of the Carboniferous series. The beds are very loosely aggregated, and the pebbles in them are invariably "pock-marked," as in Cannock Chase. Occasionally hard bands occur, in which the pebbles are never marked, as is the case also in the hard sandstones of Lancashire and West Cheshire. A boring at a point a few miles north of Birkenhead, in a fruitless search for coals, proved the pebble beds to be there above 2,000 feet in thickness. They thin south-eastwards no less than 1,400 feet in fifty miles, or an average of 28 feet per mile.

The Upper Mottled Sandstone is hardly in evidence at Creswell, and at Fullford has entirely disappeared, as in the Nottingham area. Yet on the Manchester Ship Canal it is 600 feet thick. Its attenuation in a distance of forty miles thus amounts to 15 feet per mile between South Lancashire and North Staffordshire. The Lower Keuper building-stones and basement-beds with current-bedding are not clearly cut off from the Waterstones with "way-boards" as in Cheshire. The whole series, with the Keuper marls above, reaches a united thickness at Blythe Bridge and Fullford of less than 1,000 feet, against 2,500 proved in Salt Union boring at Marston, Northwich, 30 miles distant, giving a south-easterly attenuation of 50 feet per mile.

Cretaceous.

Devonshire.—During the summer Mr. Jukes-Browne was able to examine the Upper Cretaceous strata near Honiton in Devonshire. He paid special attention to the outlier of chalk which occurs at Widworthy, between Wilmington and Suttonthorpe, as this is the most westerly inland tract of chalk in England. The old quarries, which had been observed by De la Beche and Fitton, were found to be almost wholly overgrown; but the fact was ascertained that a bed of freestone resembling the well-known Beer-stone had formerly been worked. Mr. Jukes-Browne satisfied himself that the two beds of freestone were on the same horizon. At Wilmington he

found sections which showed the succession to be similar to that at Beer Head on the coast and different from that seen at Membury, only $4\frac{1}{2}$ miles to the north-east. At Membury the Lower Chalk is still chalk, and appears to be 50 or 60 feet thick; at Wilmington there is no such chalk, its place being taken by calcareous sand and sandstone containing many fossils and resembling the beds which have been described as Cenomanian in the coast-section.

Southern Counties.—The assistance referred to in the Survey Report for 1896 as being rendered to the Geological Survey by Mr. William Hill[1] in the re-examination of the chalk for the purpose of more precisely tracing the distribution of its zones has been continued by him during the past year. He has now completed this useful work, and has collected a large body of fresh material to be used in the preparation of the memoir on the Upper Cretaceous formations and in the further revision of the maps.

Mr. Hill's investigations included an examination of the chalk of Margate, the quarries in the Upper Chalk near Chatham, Rochester, and Strood, where he identified the "Chalk with Marsupites" about $1\frac{1}{2}$ mile north-west of the last-named town. He has continued the examination of the Upper Cretaceous series around the southern margin of the Wealden area, visiting Petersfield, Arundel, and Lewes, and taking detailed notes of all important sections. The result of these traverses shows the continuity of the various zonal divisions of the Upper Cretaceous series.

In the Isle of Wight Mr. Hill studied the cliff sections, with the object of determining the true base of the chalk and of obtaining more complete details of the beds composing the Upper Greensand and the Lower, Middle, and Upper Chalk. He measured the Upper Greensand at Culver, at St. Lawrence, near Niton, and at Gore Cliff. He examined with care nearly every available section which showed the junction of the Upper Greensand with the chalk, and came to the conclusion that the true base-line of the chalk could be drawn immediately above a certain bed which, stretching with some persistence, seems to suggest a line of erosion, and marks a lithological change in the nature of the deposit. The fossils subsequently obtained from this locality by the Survey Collector threw doubt on the zonal value of this divisional line.

Mr. Hill examined and measured the Lower Chalk of Culver Cliff and Compton Bay, finding its thickness at Culver to be 203 feet and at Compton Bay 150 feet. He further ascertained the Middle Chalk at Compton Bay to be 135 feet in thickness, compared with 174 feet at Culver. The Belemnite Marls and Melbourn Rock are well developed, while the summit of the Middle Chalk is marked by a considerable thickness of exceedingly hard rough nodular chalk. He further obtained detailed sections of many of the more important quarries inland, particu-

[1] See Journal R.A.S.E., 3rd series, vol. ix., 1898, p. 795.

larly those in the Upper Chalk. In the well-known quarry at Down End he was able to identify for the first time in the island the "Chalk with Marsupites." Except in unimportant particulars, the zonal divisions of the Cretaceous series of the mainland are continued throughout the Isle of Wight.

The upper part of the Middle and the lower part of the Upper Chalk of North-West Norfolk were likewise studied by the same observer. The divisional line of the Middle and Upper Chalk is well shown in the cutting of the railway between Narboro' and Swaffham, near Broom Heath. A bed of hard crystalline rock seen here resembles chalk-rock in character and minute structure. It does not contain glauconite, but the commoner fossils of the chalk-rock occur in it. It marks the summit of the zone of *Holaster planus* in this locality, and is the most northerly point where a representative of true chalk-rock has been found. With regard to the continuation of the zone of *Holaster planus* northwards, Mr. Hill was able to confirm the observations of M. Barrois, tracing the zone through Great Bircham towards the coast. The results of his Norfolk work have been embodied in the Survey Memoir of Sheet 69.

Maiden Bradley, near Warminster, and Shaftesbury were likewise visited. At the first-named place Mr. Hill inspected a quarry exposing the junction-beds of the chalk and Upper Greensand which differs from the well-known section at Rye Hill. The fossils from this locality have been carefully collected by a local observer under the direction of Mr. Jukes-Browne. In the neighbourhood of Shaftesbury Mr. Hill was fortunate enough to obtain sections in the upper part of the Upper Greensand which filled up a gap in our knowledge of the sequence in this locality. He also examined large quarries in the Upper Chalk near Croydon, and part of the cuttings of the new railway from Croydon to Epsom, taking detailed sections where necessary. He states his opinion that there yet remains a most interesting and important question for Cretaceous geologists, viz. the correlation of the Middle Chalk of Norfolk with that of Lincolnshire and Yorkshire. In the present state of our knowledge neither Mr. Jukes-Browne nor Mr. Hill himself can say whether the zones of *Terebratulina gracilis* or *Holaster planus* exist in Lincolnshire, or what horizon divides the Middle from the Upper Chalk.

Mr. Lamplugh's examination of the coast-section of the Hastings Beds, while serving to show the general accuracy of the published geological map so far as the lithological boundaries are concerned, has thrown some doubt upon the identification of the clayey strata in certain instances. Thus it seems possible that the clay shown on the map as Wadhurst Clay, to the westward of Bexhill, may represent the same deposit as that which is shown as Fairlight Clay to the eastward of that place, a point of considerable importance if the question of water-supply should arise in this area. At the present stage of the inquiry, however, any positive statement on the subject would be premature.

Pleistocene and Glacial.

South Wales.—The ground surveyed in South Wales last year, including as it did a large tract of the high plateau and a number of the valleys that traverse these uplands, has yielded results of no little interest in regard to the glaciation of that region.

In reports of the Geological Survey for previous years the occurrence of ice-striæ has been recorded from parts of Monmouthshire and Glamorganshire. These markings have shown a remarkable persistence of trend from N.N.W. to S.S.E. Last year's work has greatly extended our acquaintance with the source and movements of the mass of ice by which the striation was produced.

The composition of the Drift strikingly confirms the conclusions founded upon the striation. The dip-slopes of Old Red Sandstone, and especially the valleys traversing them, are more or less overspread with semi-angular *débris* of that rock. Though it is extremely difficult to find an exact limit to such material, Mr. Cantrill has obtained ample evidence that it is in the main of glacial origin, for it contains scratched stones, occupies positions where it could be neither talus nor river-gravel, and rises into characteristic mounds in the Tâf and other valleys. The total absence of any rock other than that which forms the southern slopes of the escarpment furnishes the proof that the ice had its source on that feature and not to the north of it. Not even by the low pass (1,400 feet) at the head of the Tâf did any ice cross, for, though Drift mounds occur in the pass, they appear to contain none of the cornstones and green sandstones which crop out in Glyn Tarell on its northern side.

A sheet of boulder-clay extends from Hirwain to Glyn Neath. Although now much cut up by denudation, it has probably been almost continuous, and was certainly of great thickness. At Hirwain it has been piled at the foot of the Coal Measure escarpment, at a point where the ice hesitated, so to speak, whether to turn southwards down the Cynon or south-westwards down the Neath; and, as usual in such a situation, the mounds and ridges have no definite direction. Nearer to the Vale of Neath, on the other hand, they invariably trend to the south-west down the Vale, and thus follow the striæ. Though containing abundance of pebbly grit (Millstone Grit), limestone, and Old Red Sandstone, the matrix is a dense blue clay, derived from the Coal Measure shales. This deposit runs up to the foot of the escarpment, but is there, in at least one pre-glacial ravine, replaced by a boulder-clay of purely local origin. It would seem, therefore, that the escarpment was large enough not only to deflect the Brecknock ice-flow, but to nourish an ice-sheet of its own—an inference which is confirmed by the fact that the Rhondda Valleys, which rise on the southern slope of the scarp, are totally devoid of limestone and Old Red Sandstone boulders, although they contain well-developed lacial deposits.

It is no less certain that a short distance farther west the escarp-

ment was overidden by the Brecknock ice-sheet, for the Fforch-dwm Valley contains abundant detritus of Old Red Sandstone and Millstone Grit, with some limestone, although it lies wholly on the south side of the ridge. On the opposite side of the same part of the Vale of Neath striæ have already been noted at a high elevation on Graig Llwyd. It is clear, therefore, that the Vale was here filled to overflowing—a result not to be wondered at when the great gathering-ground above and the sudden contraction of the Vale at this point are taken into consideration. No less characteristic is the disposition of the Drift in the track of the glaciation leading by way of Coebren to the Dulais and Tawe valleys. Around and north of Ystrad-fellte it consists almost exclusively of Old Red Sandstone, but westwards and southwards it gathers limestone and pebbly grit in abundance, and the matrix, as it passes over the shales of the Millstone Grit, becomes a purplish and finally dark blue clay of the densest description. It is packed with scratched stones, and arranged in characteristic mounds and ridges, all trending south-westwards, and imposing that direction on the various streams which descend the southern slopes of the Millstone Grit. The deposit is frequently exposed to a depth of over fifty feet, and is everywhere devoid of stratification and gravel. The valley of the Perddyn was ignored by the ice-sheet.

Throughout the region described the Drift is of the kind known as "till." For though in the Old Red Sandstone area it is gravelly, it is so only from the scarcity of clay in the underlying rock, and the water-worn and more or less stratified pebble-gravels of the country farther south are conspicuous by their absence. At the same time it may be noted that no striæ have been discovered in the southern part of the coalfield, nor in the secondary area south of it, while the Drift itself does not now, and apparently never did, reach the coast near Barry and Penarth. These facts seem to limit the greatest extent of the ice-sheet in this part of South Wales to a breadth of about thirty miles, measured from its birthplace in the direction of its flow, and to indicate that "till" was the material formed by the ice-sheet near its source, while mounds of pebble-gravel accumulated towards its margin.

In glaciated districts an inland cliff of a certain height and steepness seems invariably to present a moraine-like arrangement of ridges and mounds at its foot. Numerous examples of this relation were met with. The material composing these ridges is purely local and angular, and but for its position might be attributed to talus. The material, however, now falling tends to fill up the hollows enclosed by the ridges, and thus to obliterate them. The ridges are frequently compound, and generally crescent-shaped in Cwms, but more or less rectilinear under straight precipices. This form indicates that they are the moraines of diminutive glaciers, but whether they came into existence after or during the existence of the ice-sheet there is nothing to show. In a particularly well-marked example near Abergavenny, they seem to merge into mounds of Drift of the usual character. It is worth mentioning that the

development of the ridges shows no connection with the aspect of the crag. As many face the sun as are sheltered from it.

In the course of his work on the southern side of the coalfield Mr. Cantrill has noted pebble-gravel overspreading much of the ground west of the Ely Valley. Near Pendoylan it is disposed in irregular mounds, enclosing hollows, with either small lakes or deposits of peat. The gravel consists chiefly of Pennant, but contains also fragments of chalk-flints, the origin of which remains for future investigation.

Recent.

The large sand-barrows at Merthyr Mawr, Newton, Sker, and Kenfig (coast of Glamorgan) are noted by Mr. Tiddeman as a feature of the district surveyed by him. In some places these dunes seem to have made no progress since the date of the last Ordnance Survey; in others they are still occasionally advancing. Thirteen years ago one house at the southern end of Kenfig was nearly buried in twenty-four hours, and the inhabitants had to be dug out. The old borough of Kenfig, of which a few foundations are still to be seen, had to be abandoned in the fifteenth century. It is the general opinion that the sand made great advances in the sixteenth century. Beneath the sand, where it has been blown off the original surface, Mr. Tiddeman has found many chips of flint, together with arrows, lanceheads, scrapers, awls, and disused flakes, and occasionally ancient pottery. A considerable number of flint-chips and weapons has also been picked up elsewhere by Mr. Cantrill on the Old Red Sandstone moorlands.

Practical Applications of Geology.

The applications for assistance made personally and by letter at the office of the Geological Survey, 28 Jermyn Street, London, S.W., during 1897 have included the following subjects:—Water-supply and contamination, mineral waters, sites for houses, foundations, landslips, coalfields, lime and cement, building-stones, road-metal, materials for artificial pavements, bauxite, ironstone, fuller's earth, oil-shale, asbestos, slate, salt, gypsum, polishing materials, silicification. The field work of the Survey has been the means of making known the existence and distribution of various useful minerals. The diatomaceous clays of the Bann, for instance, which were first indicated in this way, have now become the source of a new Irish industry.

As one of its duties in connection with the collection of information regarding water-supply the Geological Survey carefully collects and registers all available data regarding the sinking of wells, and now possesses a large mass of information on this subject, obtained from all parts of the country. During last year numerous records of well-sinkings and borings, as well as analyses of waters and rocks, have been added to this collection. Fifty-six such records have been presented by Mr. Whitaker. It is hoped to publish a series of memoirs, giving records of all known borings for each county in England and Wales.

RECENT AGRICULTURAL INVENTIONS.

The subjects of Applications for Patents from Sept. 11 to Dec. 9, 1899.

N.B.—Where the Invention is a communication from abroad, the name of the Inventor is shown in italics, between parentheses, after the name of the applicant.

Agricultural Machinery and Implements, &c.

No. of Application. Year 1899.	Name of Applicant.	Title of Invention.
18398	LOEPER, A. von	Mowing machines.
18470	MERCER, F. D	Cultivators.
18588	BENTALL, E. E.	Chaff-cutting machines.
18899	KILLMER, F. W.	Spades.
18927	SCHULTE-BLOME, R.	Manure and seed distributing machines.
19088	HAYES, J.	Threshing machines.
19161	LEATHERBARROW, J. B.	Sheaf-binding harvester.
19249	MAURIN, J. B.	Threshing machines.
19255	MARDESSON, F., & anr.	Seed-sowing machines.
19256	CHRISTIAN, J. J.	Machine for stacking hay, &c.
19647	HEIN, W.	Ploughs.
20025	DAUGAARD, J. A.	Cutting apparatus for mowing machines.
20274	DALE, W.	Ploughs.
20532	TIMMINGS, T.	Handles for spades, forks, &c.
20640	MAYNARD, R.	Portable chaff-cutters.
20875	SUTHERLAND, W.	Machine for cutting thistles.
21231	HONSON, C..	Potato planters.
21591	FYFE, D. A.	Chaff-cutting machines.
21671	PILLOY, N.	Apparatus for making-up trusses of straw.
21685	ROSENFELD, C. H.	Apparatus for cultivating land.
21741	COKE, W. L.	Mowing and reaping machines.
22010	MOULTON, C. J.	Potato-digging machines.
22108	BATCHMAN, G. F.	Implement for digging potatoes.
22585	MOSS, T.	Ploughs.
22602	BUCHANAN, D.	Potato diggers.
22645	ROBINSON, J. A.	Destroying weeds.
22850	PARK, A.	Sheaf-binding needle.
23346	RICHMOND, J.	Turnip thinner.
23478	EAMES, F.	Distributing manure, seeds, &c.
23491	BOULT, A. (*Billiard, A., France*)	" " "
23561	LOEVER, A. von	Potato digger.
23835	STICHELEN, A. J.	Cultivation of plants.
23930	GOBLE, T.	Beet puller.
23956	GRIFFIN, H. R.	Dividers of harvesting machines.
24243	NEWMAN, T. O.	Dredge-plough.
24382	MOSS, J. W.	Cultivators.

Stable Utensils and Fittings—Horse-shoes, &c.

No. of Application. Year 1899.	Name of Applicant.	Title of Invention.
18321	Orteig, J.	Detaching horses from vehicles.
18343	Carr-Boyd, W. J. H.	Horse-shoes.
18984	Wheway, S. B.	Swivels for harness.
19260	Evans, E. B.	Horse-shoes.
19335	Harris, J. J., & anr.	Saddles.
19489	White, J.	Preventing horses from bolting.
19492	Robins, W.	Saddles.
19592	Gidden, R. T.	Lining of collars, pads, &c.
19597	House, I. M.	Curry combs.
19874	Wilson, G.	,,
19905	Hughes, E.	Horse-shoes.
20219	Liggins, E., & anr.	Saddlery and harness.
20238	Sonne, E.	Feeding-bags.
20356	Marsovsky	Horse-shoes.
20381	Young, J.	Breeching straps.
20400	Marson, G. F.	Bits.
20576	Kast, M.	Temporarily masking the eyes of horses.
20653	Tüchler, E., & anr.	Horse-shoes.
20707	,, ,, ,,	,,
20984	Buer, A.	Pad for horse-shoes.
21111	Fisher, T., & another	Horse-shoes.
21135	Wood, J. S.	Saddles.
21208	Whitelow, E. T. (*Wesselmann, Germany*)	Horse-shoe.
21312	Buddenberg, H. R.	Releasing runaway or fallen horses from vehicles.
21314	McDougall, R.	Horse-shoes.
21410	Slatford, W. F.	,,
21622	Daws, G.	Nosebags.
21636	Smith, J.	,,
22624	McQueen, F.	Automatically releasing fallen horses from poles of vehicles.
22872	Gollidge, J.	Reins.
22925	Jagger, A.	Shoeing horses.
23018	Owen, R., & another	Horse-shoe.
23197	Turpaud, E.	Horse-shoes.
23307	Crocker, E.	Bits.
23439	Freeman, W.	Non-cutting horse-shoe.
23523	Wethered, E. R.	Bridle fittings.
23708	Campbell, W. O.	Harness saddles.
24232	Brooke, F. R.	Horse collars.
24529	Jessop, G. B., & anr.	Non-slipping cushion for horses' feet.

Dairy Utensils, &c.

Year 1899.		
18796	Bradford, T.	Churns and churning machinery.
19698	Von Mering, F. J.	Treatment and utilisation of milk.
19932	Sanders, F. A.	Milk-straining machine.
20748	Rowat, J.	Handles for wire-cutters of cheese.
20826	Southall, C.	Butter-pat shapers.
20960	Cumming, J. N.	Churn.
21166	Bundy, C. C.	Milking machines.
23357	Brown, W. A.	Cutting appliance applicable to butter & cheese
23393	Durand, R.	Milk-can

No. of Application. Year 1899.	Name of Applicant.	Title of Invention.
33633	ASPINWALL, L. A.	. Churns.
23828	JOHNSON, J. T. .	. Sterilising milk, &c.
23997	WYATT, T., & anr.	. Cheese cutter.
24041	MAFFEI, A. S. .	. Transforming cows' milk into milk for nourishing children.
24114	FROST, A. E. .	. Filtering milk.

Poultry and Pigeon Appliances.

Year 1899.		
18304	PATERSON, A. F.	. Incubators.
18650	PERRY, R. . .	. "
18911	RANDELL, J. .	. Bird and poultry fountains.
19689	BUCKMASTER, H.	. Hen-house ventilator.
19953	HIBBERT, J. .	. Nests for fowls.
20561	POWELL, A. .	. Poultry houses and coops.
21073	LOVELL, J. S. (*Diffre, L., France*) .	. Incubators.
21574	RUSSELL, G. F. .	. Poultry houses.
21610	OLDACRE, R. .	. Combined shelter and coop.
23244	CLARK, P. . .	. Poultry and pigeon fountain.
24389	DERVILLES, J. .	. Incubators.

Miscellaneous.

Year 1899.		
19749	DARIMONT, V. .	. Bee-hives.
20946	McDOUGALL, I. S.	. Animal wash.
24284	LAYFIELD, J. .	. Tether.

Numbers of Specifications relating to the above subjects published since September 10, 1899.[1]

(Price 8*d*. each copy.)

Specifications of 1898.

15143, 19604, 19898, 20856, 21118, 21119, 21234, 21520, 21648, 21656, 21681, 21737, 21738, 21930, 22009, 22287, 23800, 24132, 24184, 24237, 24403, 24410, 24635, 24782, 25031, 25096, 25500, 26125, 27121, 27330, 27436, 27635.

Specifications of 1899.

788, 1196, 1367, 2099, 2295, 2513, 2563, 2846, 3030, 6570, 6619, 6922, 7714, 9237, 11808, 11837, 12074, 12465, 12709, 14006, 14522, 14611, 15289, 15304, 15461, 15878, 15905, 16203, 16368, 16895, 16966, 17170, 18571, 18899, 19042, 21203, 21546.

[1] Copies may be obtained at the Patent Office (Sale and Store Branch), Quality Court, Chancery Lane, London, E.C.

STATISTICS AFFECTING BRITISH AGRICULTURAL INTERESTS.

TABLE I.—*Acreage under each kind of* **Crop, Bare Fallow,** *and* **Grass,** *as returned upon June* 5, 1899, *and June* 4, 1898, *in Great Britain, with Totals for the United Kingdom.*

—		Great Britain 1899	Great Britain 1898	United Kingdom, including Isle of Man and Channel Islands 1899	United Kingdom, including Isle of Man and Channel Islands 1898
		acres	acres	acres	acres
Total Area of Land and Water (a)		56,775,981	56,775,981	77,675,572	77,675,572
Total Acreage under all Kinds of Crops, Bare Fallow, and Grass (b)		32,457,107	32,477,031	47,795,270	47,792,474
Corn Crops.	Wheat	2,000,981	2,102,206	2,055,283	2,158,465
	Barley or Bere	1,982,108	1,903,666	2,159,396	2,068,760
	Oats	2,959,755	2,917,760	4,109,964	4,097,791
	Rye	52,236	68,795	64,440	81,285
	Beans	249,056	231,964	251,191	233,827
	Peas	162,751	175,944	163,325	176,628
	Total	7,406,887	7,400,335	8,803,599	8,816,756
Green Crops.	Potatoes	547,682	524,591	1,222,614	1,201,417
	Turnips and Swedes	1,740,993	1,772,502	2,050,422	2,087,505
	Mangel	373,942	352,235	437,307	408,812
	Cabbage, Kohl-Rabi, & Rape	173,036	165,724	219,283	214,970
	Vetches or Tares	185,891	193,612	189,769	197,420
	Other Green Crops	127,559	124,806	154,668	151,317
	Total	3,149,103	3,133,470	4,274,063	4,261,441
Clover, Sainfoin, and Grasses under Rotation.	For Hay	2,214,883	2,381,551	2,852,544	3,047,585
	Not for Hay	2,593,068	2,529,799	3,253,288	3,163,427
	Total	4,807,951	4,911,350	6,105,832	6,211,012
Permanent Pasture, or Grass *not broken up in Rotation.* (b)	For Hay	4,339,085	4,536,315	5,839,379	6,065,299
	Not for Hay	12,291,662	12,023,077	22,261,293	21,913,400
	Total	16,630,747	16,559,392	28,100,672	27,978,699
Flax		476	902	35,463	35,391
Hops		51,843	49,735	51,843	49,735
Small Fruit		71,526	69,753	(c) 71,963	(c) 70,238
Bare Fallow or Uncropped Arable Land		338,574	352,094	351,835	369,202

(*a*) Not including foreshore and tidal water.
(*b*) Not including mountain and heath land.
(*c*) Not separately shown for Ireland.

Table II.—*Number of* **Horses, Cattle, Sheep,** *and* **Pigs** *returned upon June 5, 1899, and June 4, 1898, with Totals for the United Kingdom.*

		Great Britain 1899	Great Britain 1898	United Kingdom, including Isle of Man and Channel Islands 1899	United Kingdom, including Isle of Man and Channel Islands 1898
		No.	No.	No.	No.
Horses.	Used solely for Agriculture (*a*)	1,085,395	1,075,308	(*b*) —	(*b*) —
	Unbroken Horses. 1 Year & above	304,626	318,887	(*b*) —	(*b*) —
	Unbroken Horses. Under 1 Year	126,609	122,965	(*b*) —	(*b*) —
	Total	1,516,630	1,517,160	2,028,092	2,040,330
Cattle.	Cows and Heifers in-Milk or in-Calf	2,671,260	2,587,190	4,133,249	4,035,501
	Other Cattle. 2 Years and above	1,341,310	1,381,595	2,357,207	2,414,205
	Other Cattle. 1 Year & under 2	1,388,511	1,345,844	2,391,250	2,337,184
	Other Cattle. Under 1 Year	1,394,639	1,307,735	2,462,990	2,362,322
	Total	6,795,720	6,622,364	11,344,696	11,149,212
Sheep.	Ewes kept for breeding	10,460,837	10,137,932	19,097,534	18,897,390
	Other Sheep. 1 Year and above	6,040,600	6,203,858		
	Other Sheep. Under 1 Year	10,737,317	10,401,404	12,582,691	12,204,969
	Total	27,238,754	26,743,194	31,680,225	31,102,359
Pigs.	Sows kept for breeding	375,911	362,200	(*b*) —	(*b*) —
	Other Pigs	2,247,902	2,089,395	(*b*) —	(*b*) —
	Total	2,623,813	2,451,595	4,003,589	3,719,219

(*a*) Including mares kept for breeding.
(*b*) Not separately shown for Ireland.

Table III.—*Preliminary Statement showing the Estimated Total Production of* **Hops** *in the Years* 1899 *and* 1898, *with the Acreage and Estimated Average Yield per Statute Acre, in each County of England in which Hops were grown.*

Counties	Estimated total produce 1899	Estimated total produce 1898	Acreage 1899	Acreage 1898	Estimated average yield per acre 1899	Estimated average yield per acre 1898
	cwt.	cwt.	acres	acres	cwt.	cwt.
Gloucester	672	210	42	40	16·00	5·25
Hants	30,580	11,256	2,319	2,263	13·19	4·97
Hereford	83,950	45,346	7,227	6,651	11·62	6·82
Kent	418,997	229,842	31,988	30,941	13·10	7·43
Monmouth	—	9	—	2	—	4·50
Salop	966	819	138	126	7·00	6·50
Suffolk	34	18	4	3	8·50	6·00
Surrey	15,213	6,142	1,388	1,313	10·96	4·68
Sussex	73,807	34,299	4,949	4,829	14·91	7·10
Worcester	37,207	28,657	3,788	3,567	9·82	8·03
Total	661,426	356,598	51,843	49,735	12·76	7·17

TABLE IV.—*Preliminary Statement showing the Estimated Total Produce and Yield per Acre of* **Wheat, Barley,** *and* **Oats** *in Great Britain in the Year* 1899, *with Comparative Statements for the Year* 1898, *and for the Average of the Ten Years* 1889–98.

WHEAT.

—	Estimated Total Produce		Acreage		Estimated Yield per Acre		Average of the Ten Years 1889–98
	1899	**1898**	**1899**	**1898**	**1899**	**1898**	
	Bushels	Bushels	Acres	Acres	Bushels	Bushels	Bushels
England .	62,380,067	69,074,387	1,899,827	1,987,385	32·83	34·76	29·85
Wales . .	1,380,938	1,582,086	53,898	58,960	25·62	26·83	24·03
Scotland .	1,768,320	2,372,383	47,256	55,861	37·42	42·47	36·94
Great Britain	65,529,325	73,028,856	2,000,981	2,102,206	32·75	34·74	29·86

BARLEY.

—	Estimated Total Produce		Acreage		Estimated Yield per Acre		Average of the Ten Years 1889–98
	1899	**1898**	**1899**	**1898**	**1899**	**1898**	
	Bushels	Bushels	Acres	Acres	Bushels	Bushels	Bushels
England .	56,164,313	55,377,522	1,635,634	1,562,761	34·34	35·44	33·16
Wales . .	3,328,494	3,377,413	105,978	102,921	31·41	32·82	29·87
Scotland .	8,222,891	9,296,983	240,496	237,984	34·19	39·07	36·29
Great Britain	67,715,698	68,051,918	1,982,108	1,903,666	34·16	35·75	33·26

OATS.

—	Estimated Total Produce		Acreage		Estimated Yield per Acre		Average of the Ten Years 1889–98
	1899	**1898**	**1899**	**1898**	**1899**	**1898**	
	Bushels	Bushels	Acres	Acres	Bushels	Bushels	Bushels
England .	73,905,288	75,282,761	1,781,649	1,731,157	41·48	43·49	40·84
Wales . .	7,527,952	8,389,938	220,233	230,670	34·18	36·37	33·06
Scotland .	33,313,304	35,248,218	957,873	955,933	34·78	36·87	36·74
Great Britain	114,746,544	118,920,917	2,959,755	2,917,760	38·77	40·76	38·86

Royal Agricultural Society of England.

(*Established May* 9, 1838, *as the* ENGLISH AGRICULTURAL SOCIETY, *and Incorporated by Royal Charter on March* 26, 1840.)

Patron.

(*Letter from Secretary of State, dated March* 6, 1840.)

HER MOST GRACIOUS MAJESTY THE QUEEN.

President for 1898—1899.

THE EARL OF COVENTRY.

Trustees.

Year when elected on Council	
1879	H.R.H. THE PRINCE OF WALES, K.G., *Marlborough House, Pall Mall.*
1895	H.R.H. THE DUKE OF YORK, K.G., *York House, St. James's Palace.*
1858	BRIDPORT, Gen. Viscount, G.C.B., *Royal Lodge, Windsor Great Park.*
1871	EGERTON OF TATTON, Earl, *Tatton Park, Knutsford, Cheshire.*
1881	GILBEY, Sir WALTER, Bart., *Elsenham Hall, Essex.*
1863	KINGSCOTE, Col. Sir NIGEL, K.C.B., *Kingscote, Wotton-under-Edge, Gloucestershire.*
1848	LAWES, Sir JOHN BENNET, Bart., *Rothamsted, St. Albans, Herts.*
1854–59 } 1862 }	MACDONALD, Sir ARCHIBALD K., Bart., *Woolmer Lodge, Liphook, Hants.*
1852–57 } 1866 }	RICHMOND AND GORDON, Duke of, K.G., *Goodwood, Chichester, Sussex.*
1869	RIDLEY, Rt. Hon. Sir M. W., Bart., M.P., *Blagdon, Cramlington Northumberland.*
1874	SPENCER, Earl, K.G., *Althorp, Northampton.*
1892	WESTMINSTER, Duke of, K.G., *Eaton Hall, Chester.*

Vice-Presidents.

1889	H.R.H. PRINCE CHRISTIAN, K.G., *Cumberland Lodge, Windsor, Berkshire*
1895	BEDFORD, Duke of, *Woburn Abbey, Bedfordshire.*
1882	CAWDOR, Earl, *Stackpole Court, Pembrokeshire.*
1874	CHANDOS-POLE-GELL, H., *Hopton Hall, Wirksworth, Derbyshire.*
1872–74 } 1884 }	CHAPLIN, Rt. Hon. HENRY, M.P., *Stafford House, St. James's, S.W.*
1885	COVENTRY, Earl of, *Croome Court, Severn Stoke, Worcestershire.*
1876	FEVERSHAM, Earl of, *Duncombe Park, Helmsley, Yorkshire.*
1865	LOPES, Rt. Hon. Sir MASSEY, Bart., *Maristow, Roborough, Devon.*
1880	MORETON, Lord, *Sarsden House, Chipping Norton, Oxon.*
1867	RAVENSWORTH, Earl of, *Ravensworth Castle, Gateshead, Durham.*
1881	THOROLD, Sir JOHN H., Bart., *Syston Park, Grantham, Lincolnshire.*
1870	WHITEHEAD, CHARLES, *Barming House, Maidstone, Kent.*

Other Members of Council.

Year when elected on Council	
1862–66 1877	ARKWRIGHT, J. HUNGERFORD, *Hampton Court, Leominster, Herefordshire.*
1880	*ASHWORTH, ALFRED, *Tabley Grange, Knutsford, Cheshire.*
1899	*ASSHETON, R. C., *Downham Hall, Clitheroe, Lancashire.*
1899	*BARING, Viscount, *Stratton, Micheldever, Hants.*
1895	BLAKE, GEORGE, *The Red House, Amesbury, Wiltshire.*
1871	*BOWEN-JONES, J., *Ensdon House, Montford Bridge, Salop.*
1890	BROUGHAM AND VAUX, Lord, *Brougham Hall (Penrith), Westmorland.*
1898	CAVENDISH, VICTOR C. W., M.P., *Holker Hall, Lancashire.*
1898	CECIL, Lord ARTHUR, *Orchardmains, Tonbridge, Kent.*
1893	*CORNWALLIS, F. S. W., M.P., *Linton Park, Maidstone, Kent.*
1887	*CRUTCHLEY, PERCY E., *Sunninghill Lodge, Ascot, Berkshire.*
1891	CURTIS-HAYWARD, Lieut.-Col. J. F., *Quedgeley, Gloucester.*
1888	*DARBY, ALFRED E. W., *Little Ness, Shrewsbury.*
1895	*DERBY, Earl of, K.G., *Knowsley, Prescot, Lancashire.*
1891	*DUGDALE, J. MARSHALL, *Llwyn, Llanfyllin* (viâ *Oswestry*), *Mont.*
1879	FOSTER, S. P., *Killhow, Carlisle, Cumberland.*
1875	FRANKISH, WILLIAM, *Limber, near Brocklesby, Lincolnshire.*
1879	*GORRINGE, HUGH, *Ashcroft, Kingston-by-Sea, Brighton, Sussex.*
1896	GRANBY, Marquis of, *Belvoir Castle (Grantham), Leicestershire.*
1879	GRENVILLE, R. NEVILLE, *Butleigh Court, Glastonbury, Somerset.*
1888	HORNSBY, JAMES, *Laxton Park (Stamford), Northamptonshire.*
1883–90 1894	*JERSEY, Earl of, G.C.M.G., *Middleton Park, Bicester, Oxon.*
1897	LEVETT, Captain W. S. B., *Milford Hall, Stafford.*
1886	*MAINWARING, C. S., *Galltfaenan, Trefnant R.S.O., North Wales.*
1897	MARSHALL, HENRY D., *Carr House, Gainsborough, Lincolnshire.*
1874	*MARTIN, JOSEPH, *Highfield House, Littleport, Isle of Ely, Cambs.*
1884	*MILLER, T. HORROCKS, *Singleton Park, Poulton-le-Fylde, Lancashire.*
1886	MUNTZ, PHILIP ALBERT, M.P., *Dunsmore, Rugby, Warwickshire.*
1881	*PARKER, Hon. CECIL T., *Eccleston, Chester.*
1895	*PEASE, ALFRED E., M.P., *Pinchinthorpe House, Guisborough, Yorkshire.*
1886	*PELL, ALBERT, *Hazelbeach, Northampton.*
1889	PIDGEON, DANIEL, *The Long House, Leatherhead, Surrey.*
1886	RANSOME, J. E., *Holme Wood, Ipswich, Suffolk.*
1897	*REYNARD, FREDERICK, *Sunderlandwick, Driffield, Yorkshire.*
1897	ROGERS, C. COLTMAN, *Stanage Park, Brampton Bryan, Herefordshire.*
1889	*ROWLANDSON, SAMUEL, *Newton Morrell, Barton R.S.O., Yorkshire.*
1894	RYLAND, HOWARD P., *Moxhull Park, Erdington, Birmingham.*
1874	SANDAY, GEORGE H., *Highfield House, Uxbridge, Middlesex.*
1886	*SMITH, ALFRED J., *Rendlesham, Woodbridge, Suffolk.*
1889	SMITH, HENRY, *The Grove, Cropwell Butler, near Nottingham.*
1891	*STANYFORTH, E. WILFRID, *Kirk Hammerton Hall, York.*
1875	STRATTON, RICHARD, *The Duffryn, Newport, Monmouthshire.*
1883	SUTTON, MARTIN J., *Henley Park, Oxon.*
1889	*TAYLOR, GARRETT, *Trowse House, Norwich.*
1890	*TERRY, JOSEPH P., *Berry Field, Aylesbury, Buckinghamshire.*
1882	WARREN, REGINALD AUGUSTUS, *Preston Place, Worthing, Sussex.*
1889	WHEELER, E. VINCENT V., *Newnham Court, Tenbury, Worcestershire.*
1898	WILLIAMS, J. C., *Caerhays Castle, St. Austell, Cornwall.*
1889	*WILSON, C. W., *Rigmaden Park, Kirkby Lonsdale, Westmorland.*
1865	*WILSON, Sir JACOB, *Chillingham Barns, Belford, Northumberland.*

* *Members of Council who retire by rotation, but who may be re-elected.*

STANDING COMMITTEES

*** The PRESIDENT is a Member *ex officio* of all Committees, and the TRUSTEES and VICE-PRESIDENTS are Members *ex officiis* of all Standing Committees except the Committee of Selection.

Finance Committee.

KINGSCOTE, Col. Sir NIGEL (Chairman).
RIDLEY, Sir M. W., Bart., M.P.
THOROLD, Sir J. H., Bart.
ASHWORTH, A.
CRUTCHLEY, P. E.
FRANKISH, W.
ROWLANDSON, S.
SANDAY, G. H.

House Committee.

CHAIRMAN of Finance Committee.
THE PRESIDENT.
WESTMINSTER, Duke of.
BRIDPORT, General Viscount.
PARKER, Hon. C. T.
RIDLEY, Sir M. W., Bart., M.P.
GILBEY, Sir WALTER, Bart.
WILSON, Sir JACOB.

Journal Committee.

THOROLD, Sir J. H., Bart. (Chairman).
CAWDOR, Earl.
DERBY, Earl of, K.G.
JERSEY, Earl of.
ASHWORTH, A.
CORNWALLIS, F. S. W., M.P.
FRANKISH, W.
MAINWARING, C. S.
PELL, A.
PIDGEON, D.
SUTTON, MARTIN J.
WHITEHEAD, CHAS.

Chemical and Woburn Committee.

STANYFORTH, E. W. (Chairman).
BEDFORD, Duke of.
CAWDOR, Earl.
PARKER, Hon. C. T.
LAWES, Sir J. B., Bart.
THOROLD, Sir J. H., Bart.
ARKWRIGHT, J. H.
BOWEN-JONES, J.
GRENVILLE, R. N.
LEVETT, Capt. W. S. B.
PELL, A.
REYNARD, F.
ROWLANDSON, S.
RYLAND, H. P.
SUTTON, MARTIN J.
TERRY, J. P.
WARREN, R. A.

Botanical and Zoological Committee.

WHITEHEAD, CHARLES. (Chairman).
BROUGHAM AND VAUX, Lord.
PARKER, Hon. C. T.
THOROLD, Sir J. H., Bart.
ARKWRIGHT, J. H.
ASHWORTH, A.
BOWEN-JONES, J.
CORNWALLIS, F.S.W., M.P.
FRANKISH, W.
HORNSBY, J.
MAINWARING, C. S.
PELL, A.
RANSOME, J. E.
ROGERS, C. C.
WHEELER, E. V. V.
WILLIAMS, J. C.

Veterinary Committee.

PARKER, Hon. C. T. (Chairman).
DERBY, Earl of, K.G.
BROUGHAM AND VAUX, Lord.
CECIL, Lord ARTHUR.
MORETON, Lord.
THOROLD, Sir J. H., Bart.
KINGSCOTE, Col. Sir NIGEL.
WILSON, Sir JACOB.
BROWN, Prof. Sir GEORGE.
ASHWORTH, ALFRED.
CAVENDISH, VICTOR, M.P.
CHANDOS-POLE-GELL, H.
CROOKSHANK, Prof.
CRUTCHLEY, PERCY E.
CURTIS-HAYWARD, Lt.-Col.
DARBY, ALFRED.
FOSTER, S. P.
LEVETT, Capt. W. S. B.
MCFADYEAN, Prof.
MASTER OF FARRIERS' COMPANY.
MILLER, T. H.
PEASE, A. E., M.P.
PRESIDENT OF ROYAL COLL. OF VETY. SURGEONS.
REYNARD, F.
SIMONDS, Prof.
SMITH, A. J.
STANYFORTH, E. W.
WHEELER, E. V. V.
WILSON, C. W.

Stock-Prizes Committee.

SANDAY, G. H. (Chairman).
COVENTRY, Earl of.
BROUGHAM AND VAUX, Lord.
CECIL, LORD ARTHUR.
MORETON, Lord.
PARKER, Hon. C. T.
WILSON, Sir JACOB.
ARKWRIGHT, J. H.
BOWEN-JONES, J.
CAVENDISH, VICTOR C. W., M.P.
CHANDOS-POLE-GELL, H.
DARBY, ALFRED.
DUGDALE, J. MARSHALL.
FOSTER, S. P.
FRANKISH, W.
MAINWARING, C. S.
MARTIN, JOSEPH.
MILLER, T. H.
PEASE, A. E., M.P.
REYNARD, F.
ROGERS, C. C.
ROWLANDSON, S.
RYLAND, H. P.
SMITH, A. J.
SMITH, HENRY.
STANYFORTH, E. W.
TAYLOR, GARRETT.
TERRY, J. P.
WHEELER, E. V. V.
WILLIAMS, J. C.
The Stewards of Live Stock.

Implement Committee.

FRANKISH, W. (Chairman). PARKER, Hon. C. T. THOROLD, Sir J. H., Bart. WILSON, Sir JACOB. BOWEN-JONES, J. CRUTCHLEY, P. E. CURTIS-HAYWARD, Lt.-Col. GRENVILLE, R. NEVILLE. HORNSBY, JAMES. LEVETT, Capt. W. S. B. MARSHALL, H. D. MARTIN, JOSEPH. PIDGEON, D. RANSOME, J. E. REYNARD, F. ROWLANDSON, S. RYLAND, H. P. SANDAY, G. H. SMITH, A. J. STANYFORTH, E. W. The Stewards of Implements.

General Maidstone Committee.

THE WHOLE COUNCIL, with the following representatives of the LOCAL COMMITTEE:—

BARKER, JOSEPH. MAIDSTONE, Mayor of. MAIDSTONE, Town Clerk of. MONCKTON, S. L. OLIVER, JOSIAH. SEYMOUR, R. A. HAMILTON.

Showyard Works Committee.

WILSON, Sir JACOB (Chairman). PARKER, Hon. C. T. ASHWORTH, A. CRUTCHLEY, P. E. FRANKISH, W. MARTIN, JOSEPH. ROWLANDSON, S. RYLAND, H. P. SANDAY, G. H. STANYFORTH, E. W. The Steward of Forage.

Committee of Selection.

THOROLD, Sir J. H., Bart. (Chairman). THE PRESIDENT. GILBEY, SIR WALTER, Bart. ASHWORTH, A. CORNWALLIS, F. S. W., M.P. HORNSBY, JAMES. ROWLANDSON, S. TERRY, J. P.

And the Chairman of each of the Standing Committees.

Education Committee.

MORETON, Lord (Chairman). BEDFORD, Duke of. PARKER, Hon. C. T. KINGSCOTE, Col. Sir NIGEL. ARKWRIGHT, J. H. BOWEN-JONES, J. CRUTCHLEY, P. E. DUGDALE, J. MARSHALL. LEVETT, Capt. W. S. B. MAINWARING, C. S. PIDGEON, DAN. RANSOME, J. E. ROGERS, C. C. SUTTON, MARTIN J. WHEELER, E. V. V.

Dairy Committee.

DUGDALE, J. MARSHALL (Chairman). DERBY, Earl of, K.G. PARKER, Hon. C. T. THOROLD, Sir J. H., Bart. ARKWRIGHT, J. H. ASHWORTH, A. CRUTCHLEY, P. E. CURTIS-HAYWARD, Lt.-Col. DARBY, ALFRED. GRENVILLE, R. N. LEVETT, Capt. W. S. B. MAINWARING, C. S. STANYFORTH, E. W. TAYLOR, GARRETT. WHEELER, E. V. V.

Secretary.

SIR ERNEST CLARKE, 13 Hanover Square, W.

Editor of the Journal—WILLIAM FREAM, B.Sc., LL.D., *Downton, Salisbury.*
Consulting Chemist—Dr. J. AUGUSTUS VOELCKER, 13 *Hanover Square, W.*
Consulting Botanist—W. CARRUTHERS, F.R.S., 44 *Central Hill, Norwood, S.E.*
Consulting Veterinary Surgeons—Professor JAMES BEART SIMONDS, *St. John's Villa, Ryde, Isle of Wight*; Prof. Sir GEORGE T. BROWN, C.B., *Harrow.*
Zoologist—CECIL WARBURTON, M.A., *Zoological Laboratory, Cambridge.*
Consulting Engineer—F. S. COURTNEY, C.E., *Broad Sanctuary Chambers, S.W.*
Assistant Director—J. E. COMPTON-BRACEBRIDGE, 13 *Hanover Square, W.*
Superintendent of the Showyard—ROBERT S. BURGESS, 13 *Hanover Square, W.*
Consulting Surveyors—GEORGE HUNT, *Evesham, Worcestershire*; WILSON BENNISON, 66 *Ashley Road, Crouch Hill, N.*
Publisher—JOHN MURRAY, 50A *Albemarle Street, W.*
Bankers—THE LONDON AND WESTMINSTER BANK, *St. James's Square Branch.*

GEOGRAPHICAL DISTRIBUTION OF MEMBERS OF THE COUNCIL AND OF GOVERNORS AND MEMBERS OF THE SOCIETY.

Districts	Counties	Number of Governors and Members	Number of Members of Council	Names of Members of Council
A.	Bedfordshire . .	138	1	Duke of Bedford, V.P.
	Buckinghamshire	139	1	Jos. P. Terry.
	Cambridgeshire .	201	1	Joseph Martin.
	Essex	242	1	Sir Walter Gilbey, T.
	Hertfordshire .	180	1	Sir J. B. Lawes, T.
	Huntingdonshire	78	—	
	London	515	2	H.R.H. the Duke of York K.G., T.; Rt. Hon. H Chaplin, V.P.
	Middlesex . . .	86	1	G. H. Sanday.
	Norfolk	294	2	H.R.H. the Prince of Wales, K.G., T.; Garrett Taylor.
	Oxfordshire . .	152	3	Earl of Jersey; Lord Moreton, V.P.; M. J. Sutton.
	Suffolk	232	2	J. E. Ransome; A. J. Smith.
		——2,257	— 15	
B	Cumberland . .	145	1	S. P. Foster.
	Durham	200	1	Earl of Ravensworth, V.P.
	Northumberland	256	2	Sir M. White Ridley, T.; Sir Jacob Wilson.
	Westmorland . .	78	2	Lord Brougham and Vaux; C. W. Wilson.
		——679	— 6	
C	Derbyshire . . .	229	1	H. Chandos-Pole-Gell, V.P.
	Leicestershire .	226	1	Marquis of Granby.
	Lincolnshire . .	318	3	Sir J. H. Thorold, V.P.; W Frankish; H. D. Marshall.
	Northamptonshire	188	3	Earl Spencer, K.G., T.; J. Hornsby; A. Pell.
	Nottinghamshire	236	1	Henry Smith.
	Rutland	41	—	
		——1,238	— 9	

DISTRIBUTION OF MEMBERS OF THE SOCIETY—*continued.*

Districts	Counties	Number of Governors and Members	Number of Members of Council	Names of Members of Council
D.	Berkshire	201	3	H.R.H. Prince Christian, K.G., V.P.; Visct. Bridport, T.; P. E. Crutchley.
	Cornwall	119	1	J. C. Williams.
	Devonshire	147	1	Sir M. Lopes, V.P.
	Dorsetshire	76	—	
	Hampshire	230	2	Sir A. K. Macdonald, T.; Viscount Baring.
	Kent	513	3	C. Whitehead, V.P.; Lord Arthur Cecil; F. S. W. Cornwallis.
	Somersetshire	122	1	R. Neville Grenville.
	Surrey	235	1	D. Pidgeon.
	Sussex	331	3	Duke of Richmond and Gordon, K.G., T.; H. Gorringe; R. A. Warren.
	Wiltshire	146	1	G. Blake.
		—2,120	— 16	
E.	Yorkshire	—855	5	Earl of Feversham, V.P.; A. E. Pease; F. Reynard; S. Rowlandson; E. W. Stanyforth.
F.	Gloucestershire	283	2	Col. Sir Nigel Kingscote, T.; Lt.-Col. J. F. Curtis-Hayward.
	Herefordshire	153	2	J. H. Arkwright; C. C. Rogers.
	Monmouthshire	47	1	R. Stratton.
	Shropshire	345	2	J. Bowen-Jones; A. Darby.
	Staffordshire	322	1	Capt. W. S. B. Levett.
	Warwickshire	318	2	P. A. Muntz; H. P. Ryland.
	Worcestershire	225	2	Earl of Coventry, P.; E. V. V. Wheeler.
	South Wales	187	1	Earl Cawdor, V.P.
		—1,880	— 13	
G.	Cheshire	500	4	Duke of Westminster, K.G., T.; Earl Egerton, T.; Hon. Cecil T. Parker; A. Ashworth.
	Lancashire	539	4	Earl of Derby, K.G; R. C. Assheton; Victor C. W. Cavendish; T. H. Miller.
	North Wales	227	2	J. M. Dugdale; C. S. Mainwaring.
		—1,266	— 10	
Scotland		240		
Ireland		173		
Channel Islands		11		
Isle of Man		18		
Foreign Countries		182		
Honorary Members		23		
		—647		
Grand Totals		10,942	74	

GOVERNORS OF THE SOCIETY.

	Date of election as Member	Date of election as Governor
T H.R.H. THE PRINCE OF WALES, K.G....Marlborough House, S.W., and Sandringham, Norfolk	—	Feb. 3, 1864
†H.R.H. THE DUKE OF SAXE-COBURG AND GOTHA (DUKE OF EDINBURGH), K.G....Clarence House, St. James's, S.W.	—	Aug. 6, 1884
T †H.R.H. THE DUKE OF YORK, K.G....York House, St. James's Palace, S.W., and Sandringham, Norfolk	—	April 6, 1892
†H.R.H. THE DUKE OF CAMBRIDGE, K.G....Gloucester House, Piccadilly, W.	—	Aug. 6, 1862
VP H.R.H. PRINCE CHRISTIAN OF SCHLESWIG-HOLSTEIN, K.G....Cumberland Lodge, Windsor	—	Aug. 4, 1875
†ALLCROFT, Herbert John...Stokesay Court, Onibury, Salop	—	Dec. 12, 1888
†AMHERST OF HACKNEY, Lord...Didlington Hall, Brandon	Feb. 2, 1859	May 7, 1890
ANCASTER, Earl of...Normanton Park, Stamford	Mar. 3, 1869	May 5, 1875
ARCHER-HOUBLON, George B....Hallingbury Place, Bishop's Stortford	—	Mar. 6, 1889
‖†ARKWRIGHT, J. Hungerford...Hampton Court, Leominster	—	June 5, 1861
ASHBURTON, Lord...The Grange, Alresford, Hants	—	May 7, 1890
†ASHWORTH, Charles E....The Heath, Knutsford	July 5, 1865	July 29, 1892
BARNARD, Lord...Raby Castle, Darlington	—	July 27, 1892
*BATTEN, John...Aldon, Yeovil, Somersetshire	July 16, 1839	Mar. 5, 1890
VP†BEDFORD, Duke of...Woburn Abbey, Bedfordshire	—	May 3, 1893
†BEEVER, W. F. Holt...Yewden Lodge, Henley-on-Thames	April 2, 1879	June 6, 1894
†BELPER, Lord...Kingston, Derby	July 6, 1881	Mar. 6, 1895
†BENN, Thomas G....Reigny House, Newton Reigny, Penrith	Mar. 13, 1878	Aug. 2, 1882
†BLYTH, Sir James, Bart...Blythwood, Stansted, Essex	Nov. 3, 1875	July 27, 1892
BRASSEY, Henry Leonard C....Preston Hall, Aylesford, Kent	—	Feb. 3, 1892
T BRIDPORT, Gen. Viscount, G.C.B....Royal Lodge, Windsor Great Park, Berkshire	Jan. 19, 1842	April 2, 1862
†BROOKS, Sir William Cunliffe, Bart....Barlow Hall, Chorlton-cum-Hardy, Manchester	—	Aug. 7, 1872
BURGHCLERE, Lord...48 Charles Street, Berkeley Square, W.	—	Dec. 7, 1892
BURTON, Lord...Rangemore, Burton-on-Trent	Nov. 7, 1888	June 25, 1890
BUTE, Marquis of, K.T....Mount Stuart, Rothesay, N.B.	—	April 4, 1894
CADOGAN, Earl, K.G...Culford Hall, Bury St. Edmunds	—	Dec. 11, 1889
†CAIRD, James A...Cassencary, Creetown, N.B.	May 7, 1873	July 31, 1895
CALTHORPE, Lord...Elvetham, Winchfield	Nov. 7, 1883	May 2, 1894
†CATHCART, Earl...Thornton-le-Street, Thirsk	Feb. 6, 1856	April 3, 1867
‖†CAVENDISH, Victor C.W., M.P....Holker Hall, Cark-in-Cartmel, Lancashire	—	Mar. 2, 1892
VP†CAWDOR, Earl...Stackpole Court, Pembrokeshire	Mar. 3, 1863	Mar. 2, 1892
†CAWSTON, George...The Manor House, Cawston, Norfolk	—	June 6, 1894
VP†CHANDOS-POLE-GELL, H....Hopton Hall, Wirksworth, Derbyshire	Nov. 6, 1861	June 23, 1891
VP CHAPLIN, Rt. Hon. Henry, M.P....Stafford House, S.W.	—	Nov. 2, 1870
CHELSEA, Viscount, M.P....31A Green Street, Park Lane, W.	—	Feb. 6, 1895
†CLARENDON, Earl of...The Grove, Watford	June 5, 1872	May 2, 1894
†CLINTON, Lord...Heanton Satchville, Beaford, N. Devon	April 3, 1867	April 2, 1890
CLITHEROW, Colonel Edward J. S....Hotham Hall, Brough, Yorkshire	—	Feb. 6, 1889
†CORBETT, John...Impney, Droitwich	July 2 1873	Feb. 4, 1891
‖CORNWALLIS, Fiennes S. W., M.P....Linton Park, Maidstone	—	July 2, 1884

* Elected a Foundation Life Governor, March 5, 1890. † Life Governor.
T Trustee. VP Vice-President. ‖ Member of Council.

	Date of election as Member	Date of election as Governor
P †COVENTRY, Earl of...Croome Court, Severn Stoke, Worc.	April 1, 1863	April 4, 1894
†COWPER. Earl, K.G....Panshanger, Hertford	—	April 7, 1875
CRAVEN, Thomas...Woodheyes Park, Ashton-on-Mersey	May 6, 1891	Dec. 6, 1893
CREWE, Earl of...Crewe Hall, Crewe, Cheshire	Feb. 6, 1884	Mar. 7, 1894
CROOKSHANK, Prof. E. M....Saint Hill, East Grinstead	—	Nov. 6 1889
DARTMOUTH, Earl of...Patshull Hall, Wolverhampton	—	Dec. 9, 1891
‖†DERBY, Earl of, K.G., G.C.B....Knowsley, Prescot	June 3, 1874	May 2, 1894
DERWENT, Lord...Hackness Hall, Scarborough	—	April 7, 1869
†DE TRAFFORD, Sir H. F., Bart....18 Arlington Street, W.	Aug. 1, 1883	June 1, 1892
†DEVONSHIRE, Duke of, K.G....Chatsworth, Chesterfield	—	June 2, 1880
†DEWHURST, G. Littleton...Beechwood, Lymm, Cheshire	Dec. 9, 1891	May 2, 1894
†DICKSON-POYNDER, Sir J., Bart., M.P....Hartham Park, Corsham, Wilts	Nov. 2, 1887	April 2, 1890
DIGBY, Lord...Minterne House, Cerne Abbas, Dorset	—	July 25, 1894
†DULEEP-SINGH, Prince Frederick...Hockwold Hall, Brandon	—	July 25, 1894
DUNCOMBE, W. H. O...Waresley Park, Sandy, Beds	April 1, 1885	May 6, 1896
†DUNMORE, Earl of...Carlton Club, Pall Mall, S.W.	—	Feb. 3, 1869
†DURHAM, Earl of...Lambton Castle, Durham	—	July 14, 1880
T EGERTON OF TATTON, Earl...Tatton Park, Knutsford	Mar. 6, 1872	Nov. 7, 1883
†ELLESMERE, Earl of...Worsley Hall, Manchester	—	July 7, 1869
ESSEX, Earl of...Cassiobury Park, Watford	Nov. 7, 1888	Nov. 2, 1892
EXETER, Marquis of...Burghley House, Stamford	May 4, 1898	June 21, 1898
VP FEVERSHAM, Earl of...Duncombe Park, Helmsley, Yorks	Mar. 5, 1862	Mar. 3, 1875
†FIELDEN, Thomas...Grimston Park, Tadcaster	Aug. 6, 1879	Mar. 6, 1895
FIFE, Duke of, K.T....15 Portman Square, W.	—	Nov. 7, 1888
FITZWILLIAM, Earl, K.G....Wentworth Woodhouse, Rotherham	—	June 5, 1872
*FLETCHER, John Philip...Darby Lodge, Sunbury-on-Thames	Feb. 19, 1840	Mar. 5, 1890
†FORTESCUE, Earl...Castle Hill South Molton	—	Nov. 6, 1861
FREAKE, Sir Thomas G., Bart....Warfleet, Dartmouth	—	July 30, 1890
†FREEMAN-MITFORD, A. B., C.B....Batsford Park, Moreton-in-the-Marsh, Gloucestershire	—	Nov. 3, 1886
†FYTCHE, J. Lewis...The Terrace, Freshwater, Isle of Wight	April 5, 1854	June 4, 1879
T GILBEY, Sir Walter, Bart...Elsenham Hall, Essex	Nov. 2, 1870	June 5, 1889
GLENESK, Lord...Heath House, Hampstead Heath, N.W.	—	Dec. 12, 1888
GORDON, H. Panmure...Loudwater House, Rickmansworth	July 27, 1892	Mar. 1, 1893
GRAFTON, Duke of, K.G....Wakefield Lodge, Stony Stratford	—	June 3, 1884
GRAHAM, Sir Reginald H., Bart....Norton Conyers, Ripon	Nov. 1, 1882	June 25, 1895
†GRANT, Sir G. Macpherson, Bt....Ballindalloch Castle, N.B.	April 1, 1863	April 2, 1890
†GREENALL, Sir Gilbert, Bart....Walton Hall, Warrington	Feb. 3, 1892	May 2, 1894
GRIFFITHS, John James...Highbury Grange, Highbury, N.	—	May 1, 1889
GROVES, James G....Oldfield Hall, Altrincham	—	May 1, 1895
GWYNNE, John...Kenton Grange, The Hyde, N.W.	—	Mar. 5, 1879
HAREWOOD, Earl of...Goldsboro' Hall, Knaresborough	June 6, 1883	Nov. 2, 1892
HAY, Arthur W. H....Oakley Park, Hoxne, Suffolk	—	Nov. 4, 1896
†HENDERSON, Alexander, M.P....Buscot Park, Faringdon, Berks.	Nov. 5, 1890	July 28, 1897
HENRY, Mitchell...Kylemore Castle, co. Galway	Nov. 7, 1877	Dec. 10, 1890
HERTFORD, Marquis of...Ragley Park, Alcester	Aug. 2, 1882	May 7, 1884
†HEYWOOD, Sir A. Percival, Bt...Duffield Bank, Derby	April 7, 1875	Feb. 2, 1898
HODGSON, John...Nocton Hall, Nocton, Lincolnshire	—	Mar. 2, 1898
†HOLFORD, Capt. George L., C.I.E....Westonbirt, Tetbury, Glos.	—	April 6, 1892
†HOPETOUN, Earl of...Hopetoun House, South Queensferry, N.B.	Nov. 7, 1888	July 31, 1895
‖†HORNSBY, James...Laxton Park, Stamford	June 6, 1878	May 29, 1895
†HOTHFIELD, Lord...Hothfield Place, Ashford, Kent	—	May 7, 1879
*†HULSE, Col. Sir Edward, Bt...Breamore Ho., Fordingbridge	—	June 13, 1838

* Elected a Foundation Life Governor, March 5, 1890. † Life Governor.
T Trustee. VP Vice-President. ‖ Member of Council.

	Date of election as Member	Date of election as Governor
†HUTH, Louis...Possingworth, Cross-in-Hand, Hawkhurst	Dec. 12, 1888	Feb. 6, 1895
†IRWIN, Colonel T. A....Lynehow, Carlisle	May 5, 1880	June 25, 1895
†IVEAGH, Lord, K.P....5 Grosvenor Place, S.W.	—	June 6, 1894
‖†JERSEY, Earl of, G.C.M.G....Middleton Park, Bicester	June 30, 1875	April 4, 1894
JOICEY, E....Blenkinsopp Hall, Haltwhistle, Northumberland	—	Dec. 12, 1888
†JONES, Walter J. H....Blakemere, Hartford, Cheshire	April 11, 1888	May 2, 1894
*KEMBLE, Thomas...Runwell Hall, Wickford, Essex	July 10, 1839	Mar. 5, 1890
T†KINGSCOTE, Col. Sir Nigel, K.C.B....Kingscote, Wotton-under-Edge, Gloucestershire	April 6, 1854	July 1 1874
KOHLAPUR, H.H. The Maharajah of...Kohlapur, India	—	Feb. 6, 1889
†KYNNERSLEY, Thomas F....Leighton Hall, Ironbridge, Salop	Nov. 7, 1883	Nov. 4, 1891
†LANSDOWNE, Marquis of, K.G...Bowood, Calne, Wilts.	Feb. 3, 1875	Feb. 5, 1896
T†LAWES, Sir J. B., Bart...Rothamsted, St. Albans	April 29, 1846	Dec. 11, 1878
†LECONFIELD, Lord...Petworth House, Sussex	—	June 5, 1872
†LEICESTER, Earl of, K.G...Holkham Hall, Norfolk	—	Nov. 15 1843
†LEIGH, Lord...Stoneleigh Abbey, Kenilworth.	—	Dec. 1 1858
†LLANGATTOCK, Lord...The Hendre, Monmouth	Mar. 1, 1871	May 2 1894
†LONDESBOROUGH, Earl of...Londesborough Pk., Market Weighton	Nov. 5, 1862	April 2, 1890
LONDONDERRY, Marquis of, K.G....Seaham Hall, Seaham Harbour, co. Durham	—	June 3, 1885
†LONG, Rt. Hon. W. H., M.P....Rood Ashton, Trowbridge	Aug. 4, 1880	Dec. 11, 1895
†LONSDALE, Earl of...Lowther Castle, Penrith	—	July 4, 1883
VP†LOPES, Rt. Hon. Sir Massey, Bt...Maristow, Roborough, Devon	Mar. 15, 1848	May 7, 1884
LUCAS, Sir Thomas, Bart...12A Kensington Palace Gardens, W.	—	Dec. 12, 1888
MCCALMONT, Harry, M.P....Cheveley Park, Newmarket	—	Feb. 7, 1894
T†MACDONALD, Sir A. K., Bart...Woolmer Lodge, Liphook	July 31, 1849	Nov. 1, 1871
†MANVERS, Earl...Thoresby Park, Ollerton, Newark	—	July 2, 1873
†MAPLE, John...Bedford Lodge, Haverstock Hill, N.W.	Nov. 2, 1864	Mar. 5, 1890
MARSHALL, William...Mere House, Weaverham, Northwich	April 6, 1892	April 7, 1897
†MASON, James...Eynsham Hall, Witney, Oxon.	May 1, 1867	May 2, 1894
MIDDLETON, Lord...Birdsall House, York	—	Mar. 3, 1875
*MONCK, J. Bligh...Coley Park, Reading	May 23, 1839	Mar. 5, 1890
†MOORSOM-MITCHINSON-MAUDE, C. R....Harewood, Leeds	Dec. 2, 1857	July 26, 1893
VP†MORETON, Lord...Sarsden House, Chipping Norton, Oxon.	—	Mar. 3, 1875
†MOREWOOD, C. R. Palmer...Alfreton Park, Derbyshire	April 7, 1875	Feb. 7, 1894
†MORRELL, Lt.-Col. G. H., M.P....Headington Hill Hall, Oxford.	June 6, 1878	July 25, 1894
†MOUNT-EDGCUMBE, Earl of...Mount-Edgcumbe, Plymouth	Nov. 6, 1861	Mar. 5, 1890
MUNCASTER, Lord...Muncaster Castle, Ravenglass, Cumberland	—	June 23, 1891
†MUNTZ, George F...Umberslade Park, Birmingham	Dec. 4 1867	June 30, 1875
NEELD, Sir Algernon W., Bart...Grittleton, Chippenham	Nov. 7, 1888	Dec. 9, 1891
NORFOLK, Duke of, K.G....Arundel Castle, Sussex	—	July 29, 1891
†NORTHBROOK, Earl of...Stratton, Micheldever Station, Hants	—	June 2, 1880
†PALMER, Walter...Frognal, Sunninghill, Berks.	—	Feb. 1, 1899
PARK, Philip...The Oaks, Penwortham, Preston	—	Nov. 4, 1896
‖†PARKER, Hon. Cecil T...Eccleston, Chester	April 7, 1876	May 25, 1898
†PEEL, Edmund. Brynypys, Ellesmere	Feb. 3, 1858	Mar. 5, 1890
†PLATT, Col. Henry...Gorddinog, Llanfairfechan	Mar. 5, 1862	Feb. 3, 1897
†PLATT, James E....Bruntwood, Cheadle, Cheshire	June 30, 1886	May 1 1895
†PORTLAND, Duke of...Welbeck Abbey, Worksop	—	June 2, 1880
†PORTMAN, Viscount...Bryanston, Blandford	Aug. 6, 1862	Mar. 5, 1890
PORTSMOUTH, Earl of...Hurstbourne Park, Whitchurch, Hant	—	Dec. 9, 1891
†POWIS, Earl of...Powis Castle, Welshpool	April 6, 1887	June 23, 1891
†QUILTER, Sir W. Cuthbert, Bart., M.P...Bawdsey Manor, Woodbridge	Mar. 3, 1886	April 7, 1897

* Elected a Foundation Life Governor, March 5, 1890. † Life Governor.
T Trustee. VP Vice-President. ‖ Member of Council.

	Date of election as Member	Date of election as Governor
†RAMSDEN, Lt.-Col. W. J. F....Rogerthorpe Manor, Pontefract	May 2, 1883	June 25, 1895
VP RAVENSWORTH, Earl of...Ravensworth Castle, Gateshead	Feb. 5, 1868	July 1, 1885
REISS, James E....36 Cadogan Square, S.W.	Feb. 7, 1883	May 2, 1894
T*†RICHMOND & GORDON, Duke of, K.G...Goodwood, Chichester	June 20, 1838	Dec. 2, 1868
T†RIDLEY, Rt. Hon. Sir Matthew W., Bart., M.P....Blagdon, Cramlington, Northumberland	April 7, 1869	May 5, 1886
RIPON, Marquis of, K.G....Studley Royal, Ripon	—	July 3, 1861
ROLLE, Hon. Mark...Bicton, Budleigh Salterton, Devon	—	Nov. 7, 1894
†ROSEBERY, Earl of, K.G...38 Berkeley Square, W.	—	June 6, 1894
ROTHSCHILD, Leopold de...Ascott, Wing, Leighton Buzzard	—	Mar. 1, 1893
ROTHSCHILD, Lord...148 Piccadilly, W.	Nov. 7, 1888	June 4, 1890
RUTLAND, Duke of, K.G....Belvoir Castle, Leicestershire	Dec. 12, 1888	Dec. 9, 1891
†SALISBURY, Marquis of, K.G...Hatfield House, Herts	—	Feb. 6, 1889
SALOMONS, Leopold...Norbury Park, Dorking	—	May 6, 1896
†SCHRÖDER, Baron J. H. W....The Dell, Egham, Surrey	Nov. 3, 1869	April 2, 1890
*§SIMONDS, Prof. James Beart...St. John's Villa, Ryde, I.W.	July 25, 1838	Mar. 5, 1890
*SIMONDS, W. Barrow...Abbotts Barton, Winchester	June 19, 1839	Mar. 5, 1890
SMITH, Hon. W. F. D., M.P...3 Grosvenor Place, S.W.	—	Dec. 9, 1891
†SMYTH, Sir J. H. Greville, Bart...Ashton Court, Bristol	—	July 3, 1878
*SPARKS, Major William...Crewkerne, Somerset	June 6, 1838	Mar. 5, 1890
T SPENCER, Earl, K.G...Althorp Park, Northampton	Dec. 5, 1860	Mar. 3, 1875
‖†STANYFORTH, E. W....Kirk Hammerton Hall, York	Feb. 6, 1884	July 31, 1895
†STARKIE, Col. Le Gendre N....Huntroyde, Burnley	Nov. 4, 1874	June 6, 1894
*STRATTON, J. Locke...Turweston House, Brackley	May 13, 1839	Mar. 5, 1890
STUBS, Peter...Blaisdon Hall, Newnham, Glos.	July 27, 1892	Dec. 12, 1894
SUTHERLAND, Duke of...Trentham, Stoke-on-Trent	Mar. 1, 1882	Dec. 7, 1892
‖†SUTTON, Martin J...Henley Park, Oxfordshire	May 1, 1878	Feb. 1, 1882
†SWINBURNE, Sir John, Bart....Capheaton, Newcastle-on-Tyne	May 1, 1867	May 7, 1890
†TANQUERAY, John S...Balmain, 5 Albany Road, St. Leonards	Feb. 16, 1848	May 8, 1849
†THOMPSON, Henry Yates...19 Portman Square, W.	—	Nov. 7, 1894
VP†THOROLD, Sir John H., Bart....Syston Park, Grantham	Aug. 5, 1868	May 1, 1889
TREDEGAR, Lord...Tredegar Park, Newport, Mon.	—	May 3, 1876
†TREMAYNE, John...Heligan, St. Austell, Cornwall	July 8, 1863	Feb. 6, 1895
TRESS, G. Russell...Whitelee, St. Boswell's, N.B.	May 29, 1895	Feb. 6, 1897
TURBERVILL, Col. J. P....Ewenny Priory, Bridgend	Mar. 5, 1884	July 27, 1892
†TWEEDMOUTH, Lord...Guisachan, Beauly, N.B.	—	July 31, 1889
WALTER, Arthur F....Bearwood, Wokingham	—	Mar. 6, 1895
†WANTAGE, Lord, V.C...Lockinge, Wantage	June 3, 1863	May 1, 1872
‖†WARREN, Reginald A....Preston Place, Worthing	June 3, 1857	June 6, 1894
WATSON, William C....Colworth, Bedford	—	Dec. 11, 1895
T WESTMINSTER, Duke of, K.G...Eaton Hall, Chester	July 3, 1860	June 5, 1872
WHITE, R. Holmes...Boulge Hall, Woodbridge	—	Nov. 3, 1897
VP†WHITEHEAD, Charles...Barming House, Maidstone	April 1, 1857	Feb. 6, 1889
†WILLIAMS, Henry...Moor Park, Harrogate	Aug. 1, 1883	Mar. 6, 1895
WILLOUGHBY DE BROKE, Lord...Kineton House, Warwick	—	Dec. 10, 1890
‖†WILSON, Sir Jacob...Chillingham Barns, Belford, Northumbd.	Dec. 5, 1860	Dec. 7, 1892
†WINDSOR, Lord...Hewel Grange, Bromsgrove	—	Nov. 6, 1878
†WRIGHT, William...Wollaton, Nottingham	May 1, 1867	Dec. 12, 1894
†YERBURGH, Robert A., M.P...Billinge, Scarr, Blackburn	—	Nov. 7, 1888
†ZETLAND, Marquis of...Aske Hall, Richmond, Yorks.	Feb. 4, 1874	May 2, 1894

* Elected a Foundation Life Governor, March 5, 1890. † Life Governor. § Honorary Member.
T Trustee. VP Vice-President. ‖ Member of Council.

HONORARY MEMBERS OF THE SOCIETY.

(*"British Subjects or Foreigners who have rendered exceptional services to Agriculture or Allied Sciences," and who have been elected under Bye-law 8 as Honorary Members, without payment of subscription.*)

	Date of election as Honorary Member
BROWN, Professor Sir George T., C.B....Bryn Hyfryd, Harrow (Ordinary Member, Dec. 3, 1862)	May 1, 1878
CARTUYVELS-VAN-DER-LINDEN, Jules, M.A....215 Rue de la Loi, Brussels	Dec. 11, 1895
CHAUVEAU, Prof. Auguste, M.D., LL.D....10 Avenue Jules Janin, Passy, Paris	Dec. 6, 1893
DANNFELT, Carl Juhlin B....Consul-Genl. of Sweden and Norway, 24 Great Winchester St., E.C.	Feb. 1, 1871
FLEISCHMANN, Prof. Wm....Director of the Agricultural Institute of the Royal University of Königsberg	Dec. 12, 1894
FLEMING, George, LL.D., C.B....Higher Leigh, Combe Martin, North Devon	Mar. 13, 1878
FOSTER, Prof. Michael, M.A., Sec. R.S....Nine Wells, Great Shelford, Cambridge	Feb. 3, 1897
GILBERT, Sir J. Henry, Ph.D., D.Sc., F.R.S....Harpenden, St. Albans	July 4, 1883
HOHENBRUCK, Baron Arthur von...I Niebelungengasse 8, Vienna	Nov. 5, 1890
LIVEING, Prof. G. D., M.A., F.R.S....Cambridge	Mar. 7, 1894
MAERCKER, Prof. Dr. M....Versuchs-Station, Halle, Germany	Nov. 2, 1892
NOBBE, Dr. J. C. F....Director of the Experimental Station, Tharand, Saxony	May 6, 1896
NOCARD, Prof. Edmond...Ecole Vétérinaire, Alfort, France	Dec. 11, 1895
PASSY, Louis...45 Rue de Clichy, Paris	June 23, 1891
PROSKOWETZ, Emanuel Ritter von, Senr....Kwassitz, Moravia	Nov. 5, 1890
SANDERSON, Dr. J. Burdon, F.R.S....Oxford	May 1, 1878
SCHERBATOFF, Prince Alexander...President of the Imperial Agricultural Society of Moscow, Russia	Nov. 3, 1897
SCHLIEFFEN, Count...Schlieffenburg, bei Lalendorf, Mecklenburg, Germany	Dec. 12, 1883
SICKESZ VAN DE CLOESE, Dr. C. J....Heerengracht 17, The Hague, Holland	Dec. 9, 1891
SIMONDS, Prof. J. Beart...St. John's Villa, Ryde, Isle of Wight (Ordinary Member, July 25, 1838)	April 3, 1849
THIEL, Dr. H....Privy Councillor, and Director of the Department of Agriculture, 17 Lutherstrasse, Berlin	Aug. 1, 1883
TISSERAND, Eugène...Ancien Directeur de l'Agriculture, 17 Rue du Cirque, Paris	Aug. 1, 1883
VILMORIN, Henry L. de...17 Rue de Bellechasse, Paris (Ordinary Member Aug. 2, 1879)	June 4, 1890

SUMMARY OF MEMBERS ON THE REGISTER,

MARCH 31, 1899.

10	**Foundation Life Governors** (Members elected before the granting of the Charter on March 26, 1840).
77	**Governors** paying an annual subscription of 5*l*.
104	**Life Governors** who have compounded for their annual subscriptions.
7,069	**Members** paying an annual subscription of 1*l*.
3,547	**Life Members** who have compounded for their annual subscriptions.
112	**Life Members by Examination.**
23	**Honorary Members.**
10,942	**Total number of Governors and Members at March 31, 1899.**

Dr. BALANCE SHEET,

Corresponding figures for 1897 £		£ s. d.	£ s. d.	£ s. d.
24,721	To RESERVE FUND at December 31, 1897		23,469 15 3	
417	Interest on Consols		392 2 1	
377	" " Harewood House Debenture Stock		458 5 0	
880	Life Compositions received during 1898		845 0 0	
26,393			25,165 2 4	
2,925	Less: Contribution to Revenue (at 15*s.*) from 3,827 Life Members on Books on January 1, 1898 + 62 Compounders during 1898		2,916 15 0	
23,470				22,248 7 4
21,154	To CAPITAL as per last Account, represented by Books, Furniture, Machinery, Country Meeting Plant, Cash, &c.		25,102 9 9	
—	Add: Profit on Sale of Consols	850 3 10		
637	Balance to credit of Ordinary Income and Expenditure Account, as per Statement (*A*)	5 0 6		
			855 4 4	
			25,957 14 1	
+4,711	Less: Balance to Debit of Manchester Show Account, as per Statement (*B*)		1,567 16 2	
25,865			24,389 17 11	
	Less: Depreciation written off—			
283	Fixtures	262 5 3		
165	Furniture	155 9 7		
76	Machinery	68 14 8		
238	Country Meeting Plant	231 5 1		
—	Buildings for Pot Experiments at Woburn	113 6 2		
762			831 0 9	
25,102				23,558 17 2
£48,572				£45,807 4 6

[*Note.*—The Society's Invested Assets, as stated in this Balance Sheet, are those held by it for the benefit of its general Funds. In addition, it holds in its corporate name 8,126*l.* 8*s.* 2*d.* Consols, representing a Legacy of 9,000*l.* received in 1896 under the will of the late Mr. E. H. Hills. The income arising therefrom is, under the will, to be applied in the investigation of the value and uses of the rarer forms of ash in the cultivation of crops; and the Trust will be administered under the Charitable Trusts Acts.]

ERNEST CLARKE, *Secretary.*

WELTON, JONES & CO., *Accountants.*

DECEMBER 31, 1898. *Cr.*

Corresponding figures for 1897 £		£ s. d.	£ s. d.	£ s. d.
15,485	By 11,000*l.* CONSOLS at cost (Average cost 96*l.* 15*s.* 6⅝*d.*) . . .			10,645 12 0
	Value on December 31, 1898, *at* 111=12,210*l.* [Of this 11,000*l.* Stock, 105*l.* is held against Special Prizes.]			
15,647	By 19,500*l.* HAREWOOD HOUSE DEBENTURE STOCK at net cost to Society			19,566 11 6
	By FIXTURES at Harewood House—	£ s. d.		
3,780	Value at December 31, 1897	3,496 17 5		
284	Less: Depreciation at 7½ per cent.	262 5 3		
3,497			3,234 12 2	
	By FURNITURE—			
3,427	Value at December 31, 1897	3,262 6 2		
165	Less: Depreciation at 7½ and 5 per cent.	155 9 7		
3,262		3,106 16 7		
—	Added during 1828	15 12 0		
			3,122 8 7	
1,500	By PICTURES (500*l.*) and BOOKS (1,000*l.*)		1,500 0 0	
	By MACHINERY—			
764	Value at December 31, 1897	687 5 11		
76	Less: Depreciation at 10 per cent.	68 14 8		
687			618 11 3	
	By COUNTRY MEETING PLANT—			
4,750	Value at December 31, 1897	4,625 1 9		
238	Less: Depreciation at 5 per cent..	231 5 1		
4,513		4,393 16 8		
112	Added during 1898	213 17 4		
4,625			4,607 14 0	
—	By Cost of WATER PIPES (less depreciation).		692 13 0	
1,069	By Cost of Erection of BUILDINGS for "POT EXPERIMENTS" at Woburn	1,226 12 4		
	Less: Depreciation.	113 6 2		
			1,113 6 2	
14,640				14,889 5 2
342	By Sundry DEBTORS	716 1 3		
1,263	By Expenditure on Account of 1899	56 7 3		
	By CASH and SECURITIES IN HAND, December 31, 1898—			
398	Secretary, Superintendent, and Consulting Chemist	171 13 5		
2,558 / 1,839	Consols Certificates for 900*l.*, taken at average cost to Society (96*l.* 15*s.* 6⅝*d.* per cent.) . . .	871 0 0		
4,795			1,815 1 11	
3,497	Less: Sundry CREDITORS	970 7 9		
110	Less: Subscriptions received in 1898, but belonging to 1899, and carried forward	97 0 0		
—	Less: Net Receipts in connection with Maidstone Meeting	41 18 4		
			1,109 6 1	
3,607				705 15 10
	[*Memorandum.*—The above Assets are exclusive of the value of the stock of Journals, Pamphlets, and Diagrams; and also of 322*l.*, the amount recoverable in respect of arrears of Subscriptions to December 31, 1898.]			
£48,572				£45,807 4 6

Examined, audited, and found correct, this 13th day of March, 1899.

A. H. JOHNSON
HENRY GRINLING
JONAS M. WEBB
} *Auditors on behalf of the Society.*

Income.

Corresponding figures for 1897 £		£ s. d.	£ s. d.
	ANNUAL SUBSCRIPTIONS:—		
414	*Governors*: Subscriptions for 1898	391 0 0	
101	*Members*: Received in 1897, but belonging to 1898	110 0 0	
6,922	Subscriptions for 1898	6,845 15 0	
67	Subscriptions for previous years	64 0 0	
129	Interest allowed by Bankers, &c.	62 18 1	
7,633			7,473 13 1
	LIFE COMPOSITIONS:—		
2,925	Contribution to Revenue (See Balance Sheet)— 3,889 Life Members at 15*s*.		2,916 15 0
£10,558			£10,390 8 1

ERNEST CLARKE, *Secretary*.

WELTON, JONES & CO., *Accountants*.

Expenditure.

Corresponding figures for 1897 £		£ s. d.	£ s. d.
	General Administration:—		
2,273	Proportion of Salaries of Secretarial Staff (including Temporary Assistance)	2,286 2 6	
190	Pensions to Officials	302 10 0	
47	Professional Charges	40 19 0	
10	Grant to Mansion House Association on Railway and Canal Traffic	10 10 0	
1,847	House Rent, Taxes, Insurance, & Ordinary House Exps. & Repairs	1,829 7 10	
—	Cost of Periodical Repainting and Restoration, and New Work on Harewood House	700 11 4	
37	Binding and Purchase of Books	65 10 1	
482	Printing and Stationery	393 9 11	
145	Postage and Telegrams	119 0 5	
15	Carriage of Parcels, and Cabs	15 17 3	
130	Advertising and Miscellaneous Office Expenses	40 4 0	
5,195			5,804 2 4
	Journal of Society and other Publications:—		
1,283	Printers' Bills for the four numbers of 1898	1,361 19 4	
154	Wood Engravings and Illustrations	171 17 6	
758	Editor and Literary Contributions	876 13 5	
658	Postage, Packing, and Delivery	619 15 6	
31	Miscellaneous Journal Printing	74 2 7	
51	Miscellaneous Journal Expenses	22 16 7	
33	Cost of Printing Pamphlets	32 7 0	
245	Text Book, "Elements of Agriculture"	105 10 8	
3,213		3,265 2 7	
145	Less: Received from Sales of Journal, &c. £252 5 8		
400	Advertisements in Journal 416 2 10		
55	Sales of Pamphlets and Diagrams 41 16 7		
79	Sales of Text Book on Agriculture 111 3 0		
680		821 8 1	
2,533			2,443 14 6
	Laboratory:—		
1,250	Salaries, Wages, &c.	1,100 0 0	
47	Printing, and Sundry Expenses	59 10 2	
1,297		1,159 10 2	
548	Less: Fees received from Members for Analyses	614 12 6	
749			544 17 8
	Other Scientific Departments:—		
238	Consulting Botanist's Salary	250 0 0	
200	Zoologist's Salary	200 0 0	
—	Printing and Miscellaneous Expenses	16 5 8	
500	Grant to Royal Veterinary College	500 0 0	
2	Medals for Proficiency in Cattle Pathology	2 5 6	
23	Printing	6 19 0	
60	Expenses of Grass Experiments	22 3 5	
1,023			997 13 7
—	Presentation to Hon. C. T. Parker		116 0 3
	Examination in the Science and Practice of Agriculture:—		
24	Medals	23 0 0	
75	Five Life Memberships at 15*l.* each	75 0 0	
128	Fees to Examiners	129 3 0	
7	Advertising Examination	6 17 11	
16	Printing, &c.	18 4 1	
15	Hire of Hall for Examination	15 0 0	
265		267 5 0	
—	Less: Deposits forfeited	6 0 0	
			261 5 0
	Examination in the Science and Practice of Dairying:—		
26	Hire of Premises for Examination	26 5 0	
21	Hire of Utensils, &c.	54 8 3	
56	Fees to Examiners	63 10 6	
36	Hotel and Travelling Expenses	40 11 0	
2	Printing	39 13 3	
12	Advertising Examination	11 6 3	
154		235 14 3	
—	Less: Deposits forfeited	18 0 0	
			217 14 3
9,921	Total Expenditure		10,385 7 7
637	Balance carried to Balance Sheet		5 0 6
£10,558			£10,390 8 1

Examined, audited, and found correct, this 13th day of March, 1899.

A. H. JOHNSON }
HENRY GRINLING } *Auditors on behalf of the Society.*

Receipts.

Corresponding figures for 1897		£ s. d.	£ s. d.
	SUBSCRIPTION:—		
£2,000	From Birmingham Local Committee		2,000 0 0
	Ditto: Special Grant from Local Surplus		645 0 0
	FEES FOR ENTRY OF IMPLEMENTS:—		
6,341	Implement Exhibitors' Payments for Shedding	5,935 4 0	
242	Non-members' Fees for Entry of Implements	257 0 0	
75	Fees for Entry of "New Implements"	80 0 0	
6,658			6,272 4 0
	FEES FOR ENTRY OF LIVE STOCK:—		
492	By Members:—1,741 Entries @ 10*s.*	870 10 0	
63	157 Post Entries @ 15*s.*	117 15 0	
66	62 Late " @ 1*l.*	62 0 0	
16	44 Substituted Entries @ 5*s.*	11 0 0	
215	By Non-members:—247 Entries @ 1*l.*	247 0 0	
56	69 Post Entries @ 30*s.*	103 10 0	
24	33 Late " @ 2*l.*	66 0 0	
5	3 Substituted Entries	1 5 0	
611	Fees for Horse Boxes and Stalls	462 10 0	
1,548			1,941 10 0
	FEES FOR ENTRY OF POULTRY:—		
23	By Members:—193 Entries @ 2*s.* 6*d.*	24 2 6	
3	16 Post Entries @ 5*s.*	4 0 0	
150	By Non-members:—681 Entries @ 5*s.*	170 5 0	
7	7 Post Entries @ 10*s.*	3 10 0	
4	67 Entries of Table Poultry	5 9 0	
187			207 6 6
	OTHER ENTRY FEES:—		
105	Fees for Entry of Produce		105 10 0
21	Fees for Entries in Horse-shoeing Competition		19 10 0
25	Deposits in Competitions forfeited		42 0 0
	CATALOGUE:—		
77	Extra Lines for particulars of Implement Exhibits	16 1 0	
5	Woodcuts for New Implements	6 11 3	
98	Advertisements in Catalogue	294 18 5	
380			317 10 8
37	Sales of Implement Section of Catalogue (including bound copies)	45 19 3	
940	Sales of Combined Catalogue	629 15 9	
47	" " " (bound copies) @ 2*s.* 6*d.*	31 9 6	
97	Catalogues sold after Show, &c.	17 5 7	
1,121		724 10 1	
78	Less Commission on Sales in Showyard	58 19 8	
1,043			665 10 5
	MISCELLANEOUS RECEIPTS—		
204	Fines for non-exhibition of Live Stock, &c.		136 10 0
£12,169	Carried forward		£12,352 11 7

Expenditure.

Corresponding figures for 1897.		£ s. d.	£ s. d.
	COST OF ERECTION OF SHOWYARD :—		
£8,164	Timber	7,949 16 4	
289	Ironmongery	123 5 4	
113	Paints, Oil, Glass, Lead, &c.	64 8 1	
128	Bricks, Lime, Cement, and Coal	43 14 7	
2,034	Canvas, Roofing Cloth, Felt, Baize, &c.	1,664 0 1	
581	Railway Charges, 670*l.* 10*s.* 9*d.*; Horse Hire, 162*l.* 1*s.* 2*d.*	832 11 11	
41	Insurance	40 10 9	
105	Stationery, Postage, and Telegrams	43 14 4	
22	Hire of Furniture, &c.	6 6 9	
4,073	Wages	3,330 8 0	
717	Superintendent and Consulting Surveyor: Salaries and Expenses	500 4 8	
	COST OF WATER PIPING :		
—	Proportion of original cost of Water Pipes, &c. (865*l.* 16*s.* 3*d.*), to be debited to Birmingham Meeting	173 3 3	
—	Cost of Labour and Superintendence in laying down and taking up pipes	551 1 8	
16,168		15,323 5 9	
	Less:—		
4,750	Sale of Materials . . . £4,259 18 11		
2,763	Work for Exhibitors and Purveyors . . . 1,687 5 5	5,947 4 4	
7,513			9,376 1 5
	EXPENSES OF SECRETARY'S DEPARTMENT :—		
5	Expenses of Inspection Committee	17 5 4	
16	Secretary's Journeys to Birmingham and Expenses	7 13 10	
494	Extra Clerical Assistance	164 5 10	
666	Proportion of Salaries of Ordinary Staff debited to Show Account	702 0 0	
1,181			891 5 0
	PRINTING :—		
500	Printing of Prize Sheets, Certificates, Admission Orders, Parchment Numbers, Circulars to Exhibitors, Prize Cards, Members' Tickets, and Miscellaneous	517 7 11	
15	Secretary's Local Printing	5 8 8	
56	Programmes for Members	70 15 4	
11	Plans of Showyard	54 18 3	
892	Printing of Combined Catalogues	725 0 6	
40	Binding of Catalogues	52 6 6	
43	Carriage of Catalogues to Showyard	8 2 7	
102	Printing Awards	57 8 4	
1,663			1,491 8 1
	ADVERTISING, BILL POSTING AND PLACARDING :—		
1,825	Advertising Show, Closing of Entries, &c., in Newspapers		836 3 4
	POSTAGE, CARRIAGE, &c. :—		
171	General Postage, &c., 102*l.* 18*s.* 6*d.*; Postage of Tickets to Members, 38*l.* 14*s.* 1*d.*; Carriage, 12*l.* 11*s.*		154 3 7
4,869	**AMOUNT OF PRIZES AWARDED** (for details see page xviii)		5,131 0 0
	COST OF FORAGE FOR LIVE STOCK :—		
1,003	Hay, 185*l.* 16*s.* 9*d.*; Straw, 377*l.* 14*s.* 4*d.*; Green Food, 134*l.* 15*s.* 8*d.*; Miscellaneous Expenses, 11*l.* 17*s.*; Forage for Stewards' Horses, 2*l.* 8*s.* 10*d.*		712 12 7
£20,080	Carried forward		£18,592 14 0

Receipts (*contd.*)

Corresponding figures for 1897.		£ s. d.	£ s. d.
£12,169	Brought forward		12,352 11 7
440	Amounts received from Refreshment Contractors		270 13 2
37	Premium for Cloak Room		52 10 0
	ADMISSIONS TO SHOWYARD:—		
—	Saturday, June 18, @ 2*s.* 6*d.*	31 17 3	
1,106	Monday, June 20, @ 5*s.*	613 9 1	
2,804	Tuesday, June 21, @ 2*s.* 6*d.*	1,311 19 7	
2,684	Wednesday, June 22, @ 2*s.* 6*d.*	2,788 15 10	
3,587	Thursday, June 23, @ 1*s.*	2,445 14 2	
3,664	Friday, June 24, @ 1*s.*	686 19 0	
1,120			
131	Day Tickets	86 5 0	
363	Season Tickets	157 9 6	
15,460			8,122 9 5
	ENTRANCES TO HORSE RING:—		
71	Monday, June 20	19 2 0	
318	Tuesday, June 21	213 7 0	
253	Wednesday, June 22	349 6 6	
199	Thursday, June 23	117 14 0	
354	Friday, June 24	24 4 0	
86			723 13 6
1,282			
	DAIRY:—		
30	Receipts at Stand at Dairy	19 17 6	
129	Sales of Produce at Dairy	50 13 4	
8	Receipts at Stand at Poultry Shed	4 9 0	
167			74 19 10

PRIZES AWARDED:—

Corresponding figures for 1897.			£ s. d.	£ s. d.
5,156	Horses, 2,269*l.*; Cattle, 1,707*l.*		3,976 0 0	
1,620	Sheep, 1,245*l.* 10*s.*; Pigs, 358*l.*		1,603 10 0	
245	Poultry		249 0 0	
289	Cheese, 80*l.*; Butter, 87*l.*		167 0 0	
40	Cider and Perry		40 0 0	
108	Horse-shoeing		32 0 0	
15	Implements		260 0 0	
5	Silver Medals for New Implements		5 0 0	
40	Contribution to Bee Department		40 0 0	
7,520			6,372 10 0	
	Less:—			
2,544	Prizes offered by Local Committee	£1,145 0		
96	" " Various Societies	96 10		
2,651			1,241 10 0	
4,869			£5,131 0 0	
	Debit Balance, being net loss on Meeting			1,567 16 2
£29,554				£23,164 13 8

ERNEST CLARKE, *Secretary.*
WELTON, JONES & CO., *Accountants.*

Expenditure (*contd.*)

Corresponding figures for 1897.		£ s. d.	£ s. d.
£20,080	Brought forward		18,592 14 0
	JUDGES' FEES AND EXPENSES:—		
939	Judges of Miscellaneous Implements, 34*l.* 12*s.* 5*d.*; Ditto for Lodgings, 24*l.*	58 12 5	
	Judges of Self-Moving Vehicles	51 9 0	
	Judges of Horses, 148*l.* 3*s.* 10*d.*; Cattle, 166*l.* 14*s.* 2*d.*; Sheep, 261*l.* 11*s.* 8*d.*; Pigs, 43*l.* 7*s.*; Poultry, 34*l.* 17*s.* 6*d.*; Butter, 16*l.* 3*s.* 10*d.*; Cheese, 21*l.* 16*s.* 4*d.*; Cider and Perry, 14*l.* 12*s.*; Horse-shoeing, 29*l.* 12*s.* 6*d.*; Ditto for Lodgings, 15*l.*	751 18 10	
			862 0 3
36	Badges for Judges and other Officials		32 3 3
33	Rosettes		33 12 11
	EXPENSES OF ADMINISTRATION:—		
299	*Stewards*:—Housekeeping Expenses, 76*l.* 9*s.* 8*d.*; Personal and Railway Expenses, 57*l.* 10*s.* 8*d.*; House, 80*l.*	214 0 4	
202	*Assistant Stewards*:—Honoraria, 113*l.* 10*s.*; Railway Expenses, 25*l.* 4*s.* 8*d.*	138 14 8	
110	*Secretary and Official Staff*:—House, 12*l.*; Secretary's Expenses, 8*l.* 15*s.* 7*d.*; Assist. Director's Expenses, 7*l.* 10*s.* 7*d.*; Maintenance of Clerks. 54*l.*; Travelling Expenses, 17*l.* 11*s.* 6*d.*	99 17 8	
134	*Finance Office*:—Superintendent of Turnstiles, 19*l.* 14*s.* 6*d.*; Money Takers, 55*l.* 1*s.* 7*d.*; Bank Clerks, 21*l.* 8*s.*; Commission, 10*l.* 10*s.*	106 14 1	
56	*Awards Office*:—Clerks, 32*l.* 3*s.* 10*d.*; Award Boys, 7*l.* 10*s.*	39 13 10	
801			599 0 7
	General Management:—		
215	Foreman and Assistant Foremen	159 13 4	
750	Yardmen, Grooms, and Foddermen	430 10 1	
92	Door and Gate Keepers	88 8 9	
252	Carriage Hire, 52*l.* 3*s.*; Horse Hire, 118*l.* 8*s.* 8*d.*	170 18 8	
1,309			849 10 10
130	*Veterinary Department*:—Veterinary Inspectors, 108*l.* 14*s.* 8*d.*; Stabling for Sick Horses, 6*l.*; Field for Examination, 3*l.*; Gratuities, 2*l.* 5*s.*; Declaration Forms, 1*l.* 4*s.*	121 3 8	
242	*Engineering Department*:—Consulting Engineer and Assistants, 153*l.* 12*s.* 4*d.*; Carriage, 9*l.* 18*s.* 1*d.*; Repairs and Maintenance of Machinery, 6*l.* 6*s.*; Wages to Workmen, 7*l.* 2*s.*	176 18 5	
886	*Police, &c.*:—Metropolitan Police, 754*l.* 19*s.* 2*d.*; Commissionaires, 44*l.* 12*s.* 8*d.*	799 11 10	
1,258			1,097 13 11
283	*Dairy*:—Milk, 67*l.* 18*s.* 6*d.*; Ice, 13*l.* 15*s.*; Dairy Staff, 119*l.* 19*s.* 10*d.*; Salt, 1*l.* 3*s.* 3*d.*; Utensils, 43*l.* 6*s.* 3*d.*; Coal, 1*l.* 15*s.* 9*d.*; Carriage, 2*l.* 14*s.* 8*d.*		250 13 3
23	Expenses of Analysing Milk of Dairy Cows		16 8 9
85	*Poultry*:—Penning, Attendants and Food, 25*l.* 15*s.* 6*d.*; Poultry Demonstrations, 24*l.* 8*s.*; Purchase of Dead Poultry, 18*l.* 18*s.*; Carriage of Poultry to and from Showyard, 14*l.* 10*s.* 10*d.*		83 12 4
44	*Horse-shoeing*:—Hire of Forges, 16*l.* 3*s.* 4*d.*; Horses for Competition, 5*l.* 2*s.* 6*d.*; Coal, 3*l.*; Ironmongery, 12*l.* 1*s.* 10*d.*; Wages, 2*l.* 17*s.* 1*d.*		39 4 9
	GENERAL SHOWYARD EXPENSES:—		
223	Hire of Furniture, Canvas, &c., 175*l.* 18*s.* 5*d.*; Hire of Chairs, 39*l.* 5*s.* 8*d.*; Tan, 30*l.* 19*s.* 6*d.*; Telegraph Extension, 65*l.* 17*s.* 7*d.*; Newspapers, 1*l.* 4*s.* 8*d.*; Telephone, 25*l.*; Ironmongery, 6*l.* 15*s.* 1*d.*; Tumbler Carts, 23*l.*	368 0 11	
120	Band	90 0 0	
46	St. John Ambulance Association	50 0 0	
56	Royal and Official Luncheons	30 1 6	
17	Gratuities to Bath Chairmen	12 0 0	
20	Miscellaneous Payments	15 1 5	
482			565 3 10
	EXPENSES OF TRIALS:—		
50	Consulting Engineers and Assistants	79 16 0	
23	Hotel and Travelling Expenses	43 19 9	
[illegible]	Carriage Hire, &c.	18 19 3	
72			142 15 0
25,479			
+4,074	Total Expenditure		£23,164 13 8
£29,553			

Examined, audited, and found correct, this 2nd day of December, 1898.

A. H. JOHNSON } *Auditors on behalf of the Society.*
JONAS M. WEBB }

Table showing the Number of GOVERNORS and MEMBERS in each Year from the Establishment of the Society.

Year ending with Show of	President of the Year	Governors		Members			Total
		Life	Annual	Life	Annual	Honorary	
1839	3rd Earl Spencer	—	—	—	—	—	1,100
1840	5th Duke of Richmond	86	189	146	2,434	5	2,860
1841	Mr. Philip Pusey	91	219	231	4,047	7	4,595
1842	Mr. Henry Handley	101	211	328	5,194	15	5,849
1843	4th Earl of Hardwicke	94	209	429	6,155	15	6,902[1]
1844	3rd Earl Spencer	95	214	442	6,161	15	6,927
1845	5th Duke of Richmond	94	198	527	5,899	15	6,733
1846	1st Viscount Portman	92	201	554	6,105	19	6,971
1847	6th Earl of Egmont	91	195	607	5,478	20	6,391
1848	2nd Earl of Yarborough	93	186	648	5,387	21	6,335
1849	3rd Earl of Chichester	89	178	582	4,643	20	5,512
1850	4th Marquis of Downshire	90	169	627	4,356	19	5,261
1851	5th Duke of Richmond	91	162	674	4,175	19	5,121
1852	2nd Earl of Ducie	93	156	711	4,002	19	4,981
1853	2nd Lord Ashburton	90	147	739	3,928	19	4,923
1854	Mr. Philip Pusey	88	146	771	4,152	20	5,177
1855	Mr. William Miles, M.P.	89	141	795	3,838	19	4,882
1856	1st Viscount Portman	85	139	839	3,896	20	4,979
1857	Viscount Ossington	83	137	896	3,933	19	5,068
1858	6th Lord Berners	81	133	904	4,010	18	5,146
1859	7th Duke of Marlborough	78	130	927	4,008	18	5,161
1860	5th Lord Walsingham	72	119	927	4,047	18	5,183
1861	4th Earl of Powis	84	90	1,113	3,328	18	4,633
1862	H.R.H. The Prince Consort / 1st Viscount Portman	83	97	1,151	3,475	17	4,823
1863	Viscount Eversley	80	88	1,263	3,735	17	5,183
1864	2nd Lord Feversham	78	45	1,343	4,013	17	5,496
1865	Sir E. C. Kerrison, Bart., M.P.	79	81	1,386	4,190	16	5,752
1866	1st Lord Tredegar	79	84	1,395	4,019	15	5,622
1867	Mr. H. S. Thompson	77	82	1,388	3,903	15	5,465
1868	6th Duke of Richmond	75	74	1,409	3,838	15	5,461
1869	H.R.H. Prince of Wales	75	73	1,417	3,864	17	5,446
1870	7th Duke of Devonshire	74	74	1,511	3,761	15	5,438
1871	6th Lord Vernon	72	74	1,589	3,896	17	5,648
1872	Sir W. W. Wynn, Bart., M.P.	71	73	1,655	3,953	14	5,766
1873	3rd Earl Cathcart	74	62	1,832	3,936	12	5,916
1874	Mr. Edward Holland	76	58	1,944	3,756	12	5,846
1875	Viscount Bridport	79	79	2,058	3,918	11	6,145
1876	2nd Lord Chesham	83	78	2,164	4,013	11	6,349
1877	Lord Skelmersdale	81	76	2,239	4,073	17	6,486
1878	Col. Kingscote, C.B., M.P.	81	72	2,328	4,130	26	6,637
1879	H.R.H. The Prince of Wales, K.G.	81	72	2,453	4,700	26	7,332
1880	9th Duke of Bedford	83	70	2,673	5,083	20	7,929
1881	Mr. William Wells	85	69	2,765	5,041	19	7,979
1882	Mr. John Dent Dent	82	71	2,849	5,059	19	8,080
1883	6th Duke of Richmond & Gordon	78	71	2,979	4,952	19	8,099
1884	Sir Brandreth Gibbs	72	72	3,203	5,408	21	8,776
1885	Sir M. Lopes, Bart, M.P.	71	69	3,356	5,619	20	9,135
1886	H.R.H. The Prince of Wales, K.G.	70	61	3,414	5,569	20	9,134
1887	Lord Egerton of Tatton	71	64	3,440	5,387	20	8,982
1888	Sir M. W. Ridley, Bart., M.P.	66	56	3,521	5,225	16	8,884
1889	Her Majesty The Queen	73	58	3,567	7,153	15	10,866
1890	Lord Moreton	122	58	3,846	6,941	17	10,984
1891	2nd Earl of Ravensworth	117	60	3,811	6,921	19	10,928
1892	Earl of Feversham	111	69	3,784	7,066	20	11,050
1893	Duke of Westminster, K.G.	107	74	3,786	7,138	21	11,126
1894	8th Duke of Devonshire, K.G.	113	73	3,798	7,212	22	11,218
1895	Sir J. H. Thorold, Bart.	120	80	3,747	7,179	23	11,149
1896	Sir Walter Gilbey, Bart.	126	83	3,695	7,253	23	11,180
1897	H.R.H. The Duke of York, K.G.	126	83	3,705	7,285	24	11,223
1898	Earl Spencer, K.G.	121	79	3,687	7,182	25	11,094
1899 Mar.	Earl of Coventry	114	77	3,659	7,069	23	10,942

[1] The figures for 1843 are taken from the December report, after the removal of the names of members who had discontinued their subscriptions; but it was reported in the previous May that 1,436 had been elected during the preceding twelve months, bringing the then nominal total to 7,285. In all other cases, from 1840 to 1898, the figures are from the reports of the Council to the anniversary meeting in May. It should, however, be observed that the totals were occasionally affected by the necessary revision of the list.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Proceedings of the Council.

WEDNESDAY, FEBRUARY 1, 1899.

THE EARL OF COVENTRY (PRESIDENT) IN THE CHAIR.

Present:

Trustees.—Colonel Sir Nigel Kingscote, K.C.B., Earl Spencer, K.G.

Vice-Presidents.—Earl Cawdor, Mr. H. Chandos-Pole-Gell, Lord Moreton, Sir John Thorold, Bart.

Other Members of Council.—Mr. J. Bowen-Jones, Lord Arthur Cecil, Mr. Percy E. Crutchley, Lieut.-Col. J. F. Curtis-Hayward, Mr. A. E. W. Darby, the Earl of Derby, K.G., Mr. J. Marshall Dugdale, Mr. S. P. Foster, Mr. W. Frankish, Mr. Hugh Gorringe, the Marquis of Granby, Mr. James Hornsby, Captain W. S. B. Levett, Mr. C. S. Mainwaring, Mr. Henry D. Marshall, Mr. Joseph Martin, Mr. T. H. Miller, the Hon. Cecil T. Parker, Mr. Dan. Pidgeon, Mr. J. E. Ransome, Mr. Frederick Reynard, Mr. C. C. Rogers, Mr. Howard P. Ryland, Mr. G. H. Sanday, Mr. E. W. Stanyforth, Mr. R. Stratton, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. J. P. Terry, Mr. E. V. V. Wheeler, Mr. J. C. Williams, Mr. C. W. Wilson, Sir Jacob Wilson.

Officers.—Sir Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. J. E. Compton-Bracebridge, Assistant Director; Mr. R. S. Burgess, Superintendent of the Showyard.

Professor Sir George Brown, C.B.; Professor McFadyean.

The following members of the Maidstone Local Committee were also present: The Mayor of Maidstone, and Mr. S. Lance Monckton and Mr. R. A. Hamilton Seymour (Local Secretaries).

Apologies for non-attendance were received from Earl Egerton of Tatton, Lord Brougham and Vaux, Sir Walter Gilbey, Bart., Mr. J. H. Arkwright, Mr. Alfred Ashworth, Mr. F. S. W. Cornwallis, M.P., Mr. S. Rowlandson, Mr. Henry Smith, Mr. R. A. Warren, Mr. Charles Whitehead, and Mr. W. Carruthers (Consulting Botanist).

Election of New Governor and Members.

The minutes of the last meeting of the Council, held on December 7th, 1898, having been taken as read, and approved, the election of the following Governor and fifty-one new Members was then proceeded with:—

Governor.

PALMER, Walter..Frognal, Sunninghill, Berks.

Members.

ARMITAGE, C. W...Woodlands, Northaw, Potter's Bar.
BARNES, Hon. Sir J. Gorell..Stratford Hills, Stratford St. Mary, Colchester.
BARNSLEY AGRICULTURAL SOCIETY..Westgate, Barnsley.
BARROW, Thos...Stud Farm, Appleton, Warrington.
BROWNLESS, Ernest..Whorlton Grange, Winston, Darlington.
BRUNTON, R., jun...High Farm, Marton, R.S.O., Yorks.
CARDEN, R. G...Fishmore, Templemore, co. Tipperary.

CAVE, W. H. B...Wallend, Monkland, Leominster.
CECIL, Lord J. P. Joicey..Newton Hall, Stocksfield-on-Tyne.
COPE, C. F. C...Guild Farm, Newport, Salop.
DICK, Arthur..16 St. Helen's Place, E C.
DOBBS, A. C...Knockgreau, Pallasgreen, Limerick.
EARLE, C. F...Allerton Tower, Woolton, Liverpool.
FAULKNER, A...Moss Hall Farm, Stretton, Warrington.
FIELD, W. B...Warrengate, South Mimms, Barnet.
GALTON, Francis, F.R.S...42 Rutland Gate, S.W.
GLOVER, Charles..Waddingham, Kirton Lindsey, Lincs.
GODSAL, Philip T...Iscoyd Park, Whitchurch, Salop.
HAWKES, T. H...Aynho Grounds, Banbury.
HAYWARD, G. H. Simpson..Icomb Place, Stow-on-the-Wold.
HOBLYN, E. P. Peter..Colquite, Washaway, R.S.O., Cornwall.
HOLBOURN, A. E...Gedney Marsh, Long Sutton.
JOHNSTONE, W. H...Skeynes, Edenbridge.
JONES, J. H...15 First Avenue, Hove, Sussex.
LEATHER, P. C. du S...Rosebery House, Alsager, Cheshire.
MACDONALD, Wm...Calle Fuente 18, Huelva, Spain.
MACKENZIE, Kenneth D...Birkenhill, Gartly, Aberdeenshire.
MASSEY, C. J...Closes Hall, Gisburne, Yorks.
*NEWTON, T. V...Alsina no. 2474, Buenos Ayres.
ORWIN, C. S...Byfleets, Warnham, Horsham.
PAGET, Eric M...Care of Hon. F. Eden, Boyn Hill House, Maidenhead.
*PARRY, T. Croose..Birley Court, Leominster.
PECK, Oswald..78 Wallgate, Wigan.
PROTHERO, Rowland E...3 Cheyne Walk, Chelsea, S.W.
REEVE, D'Arcy W...Friars, Matfield, Paddock Wood.
ROBERTS, J...White Birch, Hampton-on Thames.
ROBSON, T. C...High Buston House, Lesbury, Northumberland.
SANKEY, A...Mosswood Hall, Stretton, Warrington.
SIMMONS, H. W...Stilstead House, Tonbridge, Kent.
SMITH, H. E...The Grange, Walton, Ipswich.
STANLEY, Charles H...Wath-upon-Dearne, Rotherham.
STEVENS, J. B...The Manor, Ogbourne St. George, Wilts.
STRUBEN, R. H...Tafelberg Hall, Tafelberg, Cape Colony.
TAYLOR, Leonard H...Lackham, Chippenham.
TAYLOR, T...Rhoden Farm, Paddock Wood.
THORNHILL, A. J...Shotover Lodge, Oxford.
TILLARD, E. R...Manor House, Bacton, Suffolk.
TOMPSETT, B...Moors Farm, Yalding, Kent.
TOPHAM, Lupton T...Lutterworth House, Lutterworth.
WILLIAMS, T...Ynisygerwn, Neath, Glam.
WINSTANLEY, W...Stretton, Warrington.

The reports of the various Standing Committees were then presented and adopted as below:—

* Reinstated under Bye-law 12.

Finance.

Sir NIGEL KINGSCOTE reported his election as Chairman of the year. The accounts for the month ended December 31st, 1898, as certified by the Society's accountants, showed total receipts amounting to 2,687*l.* 17*s.* 2*d.*, and expenditure amounting to 3,942*l.* 5*s.* 4*d.* The accounts for the period ended January 28th, 1899, showed receipts amounting to 5,910*l.* 10*s.*, and expenditure amounting to 249*l.* 10*s.* 6*d.* Accounts amounting in all to 798*l.* 6*s.* 1*d.* had been passed, and were recommended for payment. The quarterly statement of subscriptions, arrears, and property had been laid upon the table. The Committee recommended that Mr. Frankish and Mr. Rowlandson be elected Stewards of Finance for the Maidstone Meeting. They also recommended that a fresh list of members, corrected up to date, be published: the price of such list to be 2*s.* 6*d.* to members, and 5*s.* to non-members.

Sir NIGEL KINGSCOTE, in presenting this report, said that the Society's losses by deaths and resignations had recently been severe, and he trusted that members of the Council would use their best influence to obtain new subscribers.

House.

Sir NIGEL KINGSCOTE reported his election as Chairman of the year. He also reported that the Committee had considered and approved various matters of detail in connection with the Society's premises.

Journal.

Sir JOHN THOROLD reported his election as Chairman of the year. The Committee had approved of a recommendation submitted to them by the Chemical Committee that the three articles by Dr. Voelcker on the Woburn Experimental Farm, which had appeared in the Society's Journal, be published in pamphlet form, and be on sale in the same manner as the Society's other publications, at the price of 2*s.* 6*d.* per copy. The United States Department of Agriculture had presented to the Society's library a number of books and pamphlets, completing the hitherto

imperfect sets of several of their publications, and it was recommended that the thanks of the Society be conveyed to the Department for this gift. The Editor had submitted the draft of the contents of the next number of the Journal, and various suggestions for articles and notes had been considered. An article on "The Making of the Land," by Mr. Pell, would appear in that number. It had been decided that the frontispiece of the next volume should consist of a reproduction of Ward's mezzotint of the Brothers Colling, after Weaver's portrait.

The Committee had had under consideration a correspondence between the Editor of the Journal and Mr. H. Stopes, Chairman of the Judges of the Malting and Seed Barley Competitions at the Brewers' Exhibition and Market, held at the Royal Agricultural Hall in October, 1898, on the subject of a note by Dr. E. R. Moritz, on "The Close Dressing of Malting Barley," which had appeared in the last number of the Society's Journal; and the Committee recommended that the Secretary be instructed to reply to Mr. Stopes in the following terms:—

Royal Agricultural Society of England,
13 Hanover Square,
London, W.

(opy) *February* 8, 1899.

DEAR SIR,—Your letters to Dr. Fream of January 24 and 27, with reference to an article by Dr. Moritz on "The Close Dressing of Malting Barley," in the last number of the Society's Journal, have been submitted by Dr. Fream to the Journal Committee and to the Council of this Society.

The particular purpose of Dr. Moritz's Paper is to again draw "attention to the serious injury done to barley from a malting and brewing point of view by the prevalent custom of dressing it over-closely in the threshing machine" (see p. 787). Dr. Moritz observes (p. 788) that "while the great majority of maltsters have proved themselves ready to incur the extra expense and trouble of malting slowly in the proper manner, they find themselves utterly unable to do so when the barley supplied to them is injured in the machines, for the corns which have been abraded, or cut, or from which the ends have been nipped too closely, commence to mould several days before the pieces are ripe for the kiln."

He cites (p. 789) "as an instance of the prevalent over-close dressing of this year's barleys, the very large number of corns, with ends which I considered cut off too short, contained in some samples sent to me of barleys which took prizes at the recent competition at the Agricultural Hall."

The Society has no reason whatever to doubt that the proportions which are quoted by Dr. Moritz in his article are the *bonâ fide* expression of his opinion on the particular samples sent to him; and he states specifically that "his remarks must not be held to reflect upon the samples generally."

The Council do not understand you to contest the accuracy of Dr. Moritz's general statement as to the prevalence of over-close dressing, since in your own Report, dated January 24, 1899, as Chairman of the Judges of Malting and Seed Barley at the Brewers' Exhibition and Market at the Royal Agricultural Hall held last October, you state that "*there is still considerable room for improvement in the methods of dressing*, as some farmers still set machines too closely."

The Council regret, therefore, that they do not see their way to publish in the Society's Journal "an official refutation" of the views expressed in the article in question, for which, as you will be aware from the following notice printed at the back of the title-page of each number and copy of the Journal issued, Dr. Moritz is alone responsible.

Extract from the Society's Bye-laws.

"The Society will not be responsible for the accuracy of the statements or conclusions contained in the several papers in the Journal, the authors themselves being solely responsible."

Yours faithfully,
(Signed) ERNEST CLARKE, *Secretary*.

H. Stopes, Esq.,
11 Queen Victoria Street, E.C.

Chemical and Woburn.

Mr. STANYFORTH reported that Earl Cawdor having intimated his desire not to be re-elected Chairman of the Committee, owing to the pressure of other engagements which clashed with the Society's meetings, he (Mr. Stanyforth) had been elected Chairman of the year. It had been unanimously resolved that a record should be entered upon the minutes of the Chemical Committee of the high sense the Committee entertained of the valuable services rendered by Lord Cawdor for many years as chairman of their body, together with an expression of their regret at the unavoidable circumstances which had led his Lordship to relinquish the office.

The Committee had considered the following suggestion, made by Mr. W. Lipscomb at the general meeting in December last, viz.:—

That the Society should make an endeavour to concentrate and bring to a focus the information collected by county councils and other bodies, from the various descriptions of agricultural experiments made in different parts of the country.

Whilst agreeing that the course suggested would be of the greatest

possible value, the Committee were of opinion that the accomplishment of such a task would be very difficult and expensive, and, moreover, quite beyond the province of the Society to undertake. They thought that the collection of these results would be most properly undertaken by some central authority, such as the Board of Agriculture.

Botanical and Zoological.

Mr. WHEELER reported the election of Mr. Whitehead as Chairman of the year. The Committee recommended that the pamphlet by Mr. Whitehead, entitled "Hints on Vegetable and Fruit Farming," should be reprinted as revised by him, so that the new edition might be published before the Maidstone Meeting.

Veterinary.

The Hon. CECIL PARKER reported his election as Chairman of the year. The Committee had given further consideration to a copy, forwarded by the Gloucestershire Agricultural Society, of a resolution passed by that Society describing the proposal of the London County Council to abolish private slaughter-houses in the Metropolis as "a great blow to agriculture," but did not recommend any action thereon. The Committee had also considered the following suggestion made at the general meeting by Mr. Thomas Carrick, viz.:—

> That the Council should take up, with the Board of Agriculture, the recommendations of the Report of the Royal Commission on Tuberculosis, so that any restrictive attempts aiming at stamping out the disease should be accompanied by compensation to the farmer,

and had agreed upon the following reply:—"It is admitted that the extinction of tuberculosis by the adoption of the stamping-out system, as successfully applied to cattle plague and pleuro-pneumonia, is entirely out of the question. The enormous cost that would be incurred by the slaughter of infected animals, and the impossibility of supplying their places with healthy stock, constitute difficulties which could hardly be surmounted. In any case it is extremely improbable that the Government would undertake the stamping out of the disease with the evidence which they have before them. The question of compensation for carcasses seized by the sanitary authorities on account of tuberculosis (a very rare occurrence) was carefully considered by the last Royal Commission on Tuberculosis, who had before them a number of witnesses representing the most important butchers' associations, as well as private butchers, and their evidence left no room for doubt that the total number of carcasses condemned was insignificant, and none of the witnesses who were examined, either on behalf of butchers' associations or of retail butchers, had themselves suffered any hardship from the seizure of carcasses."

They had also considered Mr. G. W. Symondson's suggestion, viz.:—

> That the Society should take into consideration the repression of cancerous diseases amongst animals,

and had agreed upon the following reply:—"Cancer, as it occurs in the human subject, is so exceedingly rare in cattle that it is hardly possible to imagine that its existence can have any influence whatever upon public health. There is, however, a disease (Actinomycosis) common to cattle feeding in fen districts, and due to the invasion of a peculiar form of fungus, which sets up irritation in the tissues, leading to the formation of tumours in the throat and other parts of the body. These tumours were formerly called wens. The disease is communicable by inoculation with the discharges from the tumours, and it was ascertained a short time ago that it is also communicable to cattle by inoculation from the human subject. The affection, however, in man is extremely rare, and is not likely to be communicated by drinking the milk or by eating the meat of cattle infected with the disease."

Professor McFadyean had presented to the Committee the following report:—

> ANTHRAX.—During the three weeks of this year for which returns have already been published, the outbreaks of anthrax numbered 25, and the animals attacked 39, as against 39 outbreaks and 67 animals attacked in the corresponding period of 1898.
>
> GLANDERS.—During the same period 41 outbreaks with 62 animals attacked have been reported, the corresponding figures for last year having been 52 and 117 respectively.

SWINE FEVER.—This disease unfortunately is more prevalent than it was twelve months ago, 127 outbreaks having been reported during the first three weeks of the year, as compared with 108 outbreaks in the corresponding period of 1898.

RABIES.—No case of this disease has been reported during the present year, and nearly four months have elapsed since the last case was notified. It is therefore permissible to hope that the disease has already been exterminated.

PLEURO-PNEUMONIA.—No case of this disease has been discovered in Great Britain or Ireland since January of last year.

MISCELLANEOUS.—Since the last meeting of the Council an opportunity was obtained to examine a number of cattle affected with contagious skin disease, and it has been ascertained that the affection is sarcoptic mange. Hitherto this disease has been regarded as of very rare occurrence in bovine animals, but there are grounds for believing that it is already rather widely distributed among British cattle. It is hoped that members of the Society who suspect the existence of the disease among their animals will communicate with the Principal of the Royal Veterinary College, in order that further investigation with regard to its pathology and treatment may be made.

During the present month two cows affected with parasitic gastritis have been admitted to the Royal Veterinary College for experimental treatment.

Copies of the new Anthrax Order of the Board of Agriculture had been laid upon the table. The Committee had approved the following leaflet on Tuberculosis in Dairy Stock, which had been drafted by Sir George Brown and Professor McFadyean, and of which it had been arranged that copies should be obtainable free on application to the Secretary.

TUBERCULOSIS IN DAIRY STOCK.

With the object of assisting dairy farmers in meeting the requirements of sanitary authorities under the present circumstances, the following suggestions are offered:

It is a matter of certainty that a notable quantity of milk which is sold to the public contains tubercle bacilli, and persons who drink it in an uncooked condition incur some risk of infection.

In a small proportion of cases tubercle bacilli may be detected in milk by microscopic examination, and such milk is always highly dangerous.

It ought to be clearly understood, however, that failure to detect the bacilli by microscopic examination of milk is not reliable evidence that such milk is free from the germs of tuberculosis.

Tuberculosis, known also as consumption, wasting, and pining, is a contagious disease, and is spread by the introduction of the tubercle bacilli into the bodies of healthy animals along with the food or drink, and in other ways. Diseased cattle eject bacilli in coughing; also in the discharge from the mouth and nose, and in the manure.

The disease in the advanced stage may be detected by an expert from the outward symptoms, but in the majority of instances there are no characteristic signs. The tuberculin test, although it does not afford any indication of the extent of the disease in the animal organism, is the only safe and almost certain method of discovering the existence of tubercle in the absence of outward symptoms.

When it is intended to employ the test, the owner of the cattle should apply to the Principal of the Royal Veterinary College, Camden Town, London, N.W., giving the name of his usual veterinary adviser, to whom printed instructions will be sent. If desired, the name of a veterinary surgeon in the district will be suggested.

Animals which exhibit the well-known characteristic reaction to the test, should be treated as tuberculous animals and be separated from those which do not react: a slight partition covered with tarred felt, to divide a shed into two parts, will suffice.

Tubercular disease of the udder ought always to be suspected when a painless hard lump, slowly enlarging, can be detected in one or more of the quarters.

HINTS AS TO THE MEANS OF PREVENTING THE SPREADING OF THE DISEASE.

All animals which are affected with diarrhœa, cough, or wasting should be removed from contact with other animals.

Insufficient food, or food of bad quality, overcrowding, imperfect ventilation, dirt, and darkness, and all other debilitating causes favour the spreading of the disease.

An open-air life is the most desirable for milch cows, and under such conditions tuberculosis shows very little tendency to spread. The cows should not be allowed to feed out of troughs in the pastures, but be taken into the sheds to have their ordinary manger-food.

The cleansing and disinfection of cowsheds are essential, and the free use of water is a most important part of the process. Sweeping and dry brushing, and the raising of dust, should be avoided.

As to the course which the owner should take with regard to the reacting cows, it can only be said that the sooner they are sent to the butcher the better. As it is impossible to determine at what particular moment the udder may be invaded, and the milk become infective, a strict regard to sanitary laws would exclude the milk of tuberculous cows as unsafe for food, unless it had been effectually sterilised before distribution or use.

That the decided effort which is now being made to arrest the spreading of consumption and other forms of tuberculosis in man will gradually lead to the enforcement of strict precautions against the sale of milk from tuberculous cows cannot be doubted; and it is of the utmost importance that dairymen should realise the necessity of doing everything in their power to eradicate tuberculosis from their herds. It has been proved that much can be done in this direction by the owner, with the advice and assistance of his veterinary adviser.

Regulations for Cowsheds.

Mr. PARKER added that the Veterinary Committee had given further consideration to the question

of regulations as to the ventilation, cleansing, drainage, and water supply of cow byres, and recommended that the President of the Board of Agriculture be asked to receive a deputation from the Council on the subject.

[Later in the day a deputation, consisting of the Earl of Coventry (President), the Earl of Derby, K.G., the Hon. Cecil Parker, Colonel Sir Nigel Kingscote, K.C.B., Sir George Brown, C.B., Mr. S. P. Foster, Mr. E. V. V. Wheeler, and Sir Ernest Clarke (Secretary), had a conference with the Right Hon. Walter Long, M.P., as to the agricultural points to be held in view in the framing of any model regulations as to cow byres.]

Stock Prizes.

Mr. SANDAY reported his election as Chairman of the year. The Committee recommended the acceptance, with thanks, of an offer by the Red Polled Cattle Society of two champion prizes of £10 each for the best Red Polled bull and the best Red Polled cow or heifer exhibited at the Maidstone Meeting. A letter had been received from the Hon. H. A. Stanhope with reference to the date at which sheep intended for exhibition at the Society's Country Meetings should be shorn, but the Committee could not recommend a reversal of the previous decision of the Council. In consequence of representations which had been made relative to the ages of the Shetland and Mountain and Moorland ponies, as printed in the Maidstone prize sheet, restricting the entries to animals four years old and upwards, the Committee recommended that the conditions should be altered to allow of the entry of animals three years old and upwards, such alteration to be published in any future edition of the prize sheet.

Judges' Selection.

Mr. SANDAY (Chairman) reported that the Committee had selected the names of gentlemen to be invited to act as judges in the several departments for the Maidstone meeting, and they recommended the issue of the invitations forthwith. A condition of the appointment was that these gentlemen do not act as judges of the same class of stock at the meeting of either the Bath and West of England Society, or the Royal Counties Agricultural Society, to be held this year.

Mr. SANDAY added that for reasons of health he was going abroad almost immediately, and would be absent for some weeks. As there would be a number of matters arising out of the selection of judges and the receipt of entries, which would require the immediate attention of the Chairman, he desired, with the permission of the Council, to nominate Sir Jacob Wilson, who had formerly been Chairman of the Stock Prizes Committee, to undertake the duties of Acting-Chairman during his (Mr. Sanday's) absence.

Sir JACOB WILSON having expressed his willingness to serve, this course was agreed to by the Council.

Implement.

Mr. FRANKISH reported his election as Chairman of the year. The implement prize sheet and regulations for the Maidstone Meeting had been duly issued. The Committee had nominated for appointment two judges for Hop Washers, Fruit Evaporators, and Fruit Packages; they had also settled various matters connected with the Maidstone meeting.

General Maidstone.

Earl SPENCER, K.G. (Chairman) reported that the local committee had assented to the offer of a fourth gold medal for Queen's Premium Stallions to be exhibited at Maidstone. The Committee had nominated judges of Hops, subject to the approval of the Judges' Selection Committee. They had also considered the proposals received from the railway companies as to special trains, &c. They regarded these as inadequate, and had adopted the view of the local committee that not less than four special trains should be run from London on each morning during the show. They had also decided several matters of detail connected with the meeting.

Showyard Works.

Sir JACOB WILSON reported his election as Chairman of the year. Progress had been made with the levelling and the approaches to the showyard at Maidstone. Estimates had been accepted for laying and taking up the water pipes in the showyard.

Selection.

Sir JOHN THOROLD reported his election as Chairman of the year. The Committee recommended that Viscount Baring, of Stratton, Micheldever, Hampshire, who had expressed his willingness to serve, be elected a member of the Council, in the room of Mr. W. T. Scarth, deceased; and that the Earl of Coventry be elected a Vice-President of the Society, in the room of the Earl of Lathom, deceased.

Formal resolutions to this effect were passed by the Council, on the motion of Sir JOHN THOROLD, seconded by Sir NIGEL KINGSCOTE.

Education.

Lord MORETON reported his election as Chairman of the year. The Society's delegates on the Joint Board for the Examination in Dairying had reported that they had held a conference with their Scottish colleagues on the 8th of December last, with reference to a suggestion made by the Highland and Agricultural Society of Scotland as to the establishment of a Joint Examination for a National Diploma in Agriculture, at which meeting the following resolution had been adopted, on the motion of Dr. Gillespie, seconded by Mr. Bowen-Jones:—"That, in the opinion of the Board, the principle of a Joint Examination in Agriculture is worthy of adoption by the two Societies." The Committee had resolved to endorse the resolution passed by the Joint Board on December 8th, and presented various recommendations as to points which they considered of importance in connection with the regulations and syllabus of any such joint examination. Arrangements had been made with Messrs. Newton and Co., of Fleet Street, E.C., for the reproduction as lantern slides of the illustrations of live stock in the Society's Text-Book, and of the wheat diagrams.

Dairy.

Mr. DUGDALE reported his election as Chairman of the year. Details connected with the Maidstone Meeting had been brought before the Committee for settlement, and they had nominated gentlemen to act as judges of Cheese. Various letters relating to the entries of cream separators for trial at Maidstone had been discussed and instructions given for replies thereto. The Committee had considered certain suggestions as to cream separators made by the Hon. H. A. Stanhope, but were of opinion that the points were fully covered by the conditions published in the regulations. The Committee had also considered the question of the conveyance of milk by rail, and were of opinion that the present custom of sending milk in unsealed churns was unsatisfactory, inasmuch as it exposed the farmer to the risk of having his milk tampered with during transit. They had given instructions for information to be obtained from the different railways as to the terms upon which milk could be conveyed by rail in sealed churns.

Mr. CHANDOS-POLE-GELL said he should like to mention his own experience in the matter of sending milk by rail. For several years he had sent the milk from seventy cows, and had never sent it in a churn that was not sealed. The Midland Railway wanted him to leave the churns unlocked, so that they might examine them, but he refused, unless the company would undertake the responsibility of delivering the milk as it was when placed upon their trucks. The course he adopted was to mark the weight of the churn on the outside, and then to calculate the weight of the milk at the rate of 10 lb. 4 oz. per gallon, at the same time furnishing the railway company with a docket stating the number of gallons, so that they could easily find out the weight of the contents of each churn. He thought

that dairymen, in the transmission of their churns, had been too much inclined to consider the cost of a label, and that the price of a penny ball of string had rather weighed with them. He had seen a porter at a London station dip a basin into a churn, which proceeding, though it added a pleasant flavour to the tea drunk by the porter, was neither for the benefit of the farmer, nor, speaking broadly, of the consumer. There was still considerable divergency of practice on this point, for at one station on the Great Western Railway the authorities would take the churns locked, while at another they would not do so. In his opinion, any one who wanted his goods delivered in proper order should not send them out without their being fastened up securely.

Suggestions made at General Meeting.

The replies to the suggestions made by members at the General Meeting on December 8th, 1898, were settled in accordance with the recommendations of the Chemical, Veterinary, and Dairy Committees.

Miscellaneous.

A letter from the Town Clerk of York as to the granting of free tickets to subscribers to the local fund was read, and the Council decided that, following the precedents of recent years, two season tickets and two day tickets be granted to the local committee for distribution in respect of each 10*l.* of the amount contributed by them to the Society's expenses in the shape of subscriptions or local prizes.

The SECRETARY reported the death on December 12th, 1898, of Sir William Anderson, K.C.B., F.R.S., who had formerly been the Society's consulting engineer, and who was one of their honorary members. Anticipating the wishes of the Council with regard to the loss of an officer who had rendered such signal service to the Society in the past, he had written to the family a letter of condolence in the Society's name, and he read a cordially worded reply from Mr. E. W. Anderson on behalf of the family.

Various letters and other documents having been laid upon the table, the Council adjourned until Wednesday, March 1st, 1899.

WEDNESDAY, MARCH 1, 1899.

THE EARL OF COVENTRY (PRESIDENT) IN THE CHAIR.

Present:

Trustees.—Sir Walter Gilbey, Bart., Colonel Sir Nigel Kingscote, K.C.B.

Vice-Presidents.—Mr. H. Chandos-Pole-Gell, the Earl of Feversham, Sir John Thorold, Bart., Mr. Charles Whitehead.

Other Members of Council.—Mr. J. H. Arkwright, Mr. Alfred Ashworth, Viscount Baring, Mr. George Blake, Mr. J. Bowen-Jones, Mr. Victor C. W. Cavendish, M.P., Lord Arthur Cecil, Mr. F. S. W. Cornwallis, M.P., Mr. Percy E. Crutchley, Lieut. Col. J. F. Curtis-Hayward, Mr. J. Marshall Dugdale, Mr. W. Frankish, Mr. Hugh Gorringe, Mr. R. Neville Grenville, Mr. James Hornsby, the Earl of Jersey, G.C.M.G., Captain W. S. B. Levett, Mr. Joseph Martin, Mr. P. A. Muntz, M.P., Mr. Albert Pell, Mr. J. E. Ransome, Mr. Frederick Reynard, Mr. C. C. Rogers, Mr. A. J. Smith, Mr. E. W. Stanyforth, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. J. P. Terry, Mr. R. A. Warren, Mr. E. V. V. Wheeler, Mr. C. W. Wilson, Sir Jacob Wilson.

Officers.—Sir Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Mr. J. E. Compton-Bracebridge, Assistant Director; Mr. R. S. Burgess, Superintendent of the Showyard.

Professor Sir George Brown, C.B.

The following members of the Maidstone Local Committee were also present: The Mayor of Maidstone, Mr. Joseph Barker, and Mr. R. A. Hamilton Seymour (Local Secretary).

Apologies for non-attendance were received from the Earl of Derby, K.G., Earl Egerton of Tatton, Earl Cawdor, Earl Spencer, K.G., Lord Brougham and Vaux, Lord Moreton, the Hon. Cecil T. Parker, Rt. Hon. Sir Massey Lopes, Bart., Mr. C. S. Mainwaring, Mr. T. H. Miller, Mr. Dan. Pidgeon, Mr. S. Rowlandson, Mr. Howard P. Ryland, Mr. Henry Smith, Professor Simonds, Dr. J. Augustus Voelcker (Consulting Chemist), and Mr. W. Carruthers (Consulting Botanist).

Election of New Members.

The minutes of the last meeting of the Council, held on February 1st, 1899, having been approved, the election of the following thirty-seven new members was then proceeded with:—

Members.

ADDIE, J. H...Llanover Estate Office, Abergavenny.
BACKHOUSE, John..Marsh End Farm, Crudley, Warrington.
BARNARDISTON, G...The Moss, Ripley, Yorks.
BENN, William H...Willaston, Harrogate.
BROWN, J. A...Chapel Farm, Barton-on-Hmbr.
COULTER, Charles M...36, Worship Street, E.C.
CUTTRISS, G. E. B...1, Fairfield Avenue, Fairfield, Manchester.
DARBY, Sidney C...Pleshey Lodge, Chelmsford.
DICKINSON, W. P...High Street, Maidstone.
DUNCAN, Cecil C...Hatfield, Priory Road, Great Malvern.
EMERY, E. C...Hurston Place, Cootham, Pulborough.
FRANCIS, Rev. J. L...108, Wood Vale, Honor Oak, S.E.
FREE, Robert, The Elms, Mistley, Essex.
GOODWIN, Theodore..MelbourneHo., Maidstone
HOBDAY, Prof. F. T. G...Royal Veterinary College, Camden Town, N.W.
HOPPER, H. R...48, Catford Hill, S.E.
HOWATSON, Thomas C.. Hafod Elwy, St. Asaph.
KENT, Thomas O...Edge Hill Farm, Four Oaks, Birmingham.
KINNEAR, Francis H...Copgrove, Burton Leonard, Leeds.
LAIDLAW, John..98, Dundas Street, Glasgow.
LEONARD, Thomas..Warrenstown, Dunsany, Co. Meath.
LONGWORTH, E. T. Dames..Creggan, Athlone, Co. Westmeath.
*MARCOLETA, Don Valentin..Santiago, Chili, South America.
MERRYWEATHER, J. Compton..4, Whitehall Court, S.W.
NORTHAMPTON, Marquis of..Castle Ashby, Northampton.
PARKER, Arthur C...Eccleston Paddocks, Ches.
RADCLIFFE, A. T...The Broadmore, Hixon, Stafford.
ROEBUCK, John..Dewar's Wharf, Commercial Road, Lambeth, S.E.
SIMONDS, H. F...Woodthorpe, Southend Road, Beckenham.

* Reinstated under Bye-law 12.

SPARLING, Rev. P. W...Erbistock Rectory, Ruabon.
STEWART, James..Rainham, Kent.
THOMAS, Iltyd..Ely Farm, near Cardiff.
WELLINGTON, Duchess of..Strathfieldsaye House, Mortimer, R.S.O., Berks.
WHITE, Edward A...Rabbs Farm, Yiewsley, Uxbridge.
WILSON, William F...Thorpe Green Farm, Thorpe, Essex.
WOODS, E. W...Walton House, near Warringtn.
WRIGHT, Wm...Flixborough, Doncaster.

The reports of the various Standing Committees were then presented and adopted as below:—

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the period ended February 25th, 1899, as certified by the Society's accountants, showed total receipts amounting to 1,223*l.* 3*s.* 4*d.*, and expenditure amounting to 798*l.* 8*s.* 3*d.* Accounts, amounting in all to 3,180*l.* 13*s.* 4*d.*, had been passed, and were recommended for payment. The Secretary had laid upon the table the Society's balance-sheet for 1898, which had been ordered to be submitted to the Auditors, and, when approved by them, to be published in the next number of the Journal.

Journal.

Sir JOHN THOROLD (Chairman) reported that the Committee had discussed the proposed arrangements for the next part of the Journal, and that a number of suggestions had been received for articles and notes. The Committee had accepted, with thanks, the kind offer of Mr. Pidgeon to write an article on the bacterial treatment of sewage. A letter had been received from Sir John Lawes presenting the Society with the remaining copies of his "Tables for Estimating Dead Weight and Value of Cattle from Live Weight," and the Committee recommended that the thanks of the Society be offered to Sir John Lawes for his generous gift. With reference to the subject of the note by Dr. Moritz in the last number of the Journal, on "The Close Dressing of Malting Barley," the Secretary had submitted the following reply to his letter of February 8th (see page xxiii.) received by him from Mr. H. Stopes; but the Committee did not consider that any further action on their part was called for:—

CUT BARLEY.

11 Queen Victoria Street,
London, E.C.
(Copy.) *February* 10, 1899.

H. STOPES & Co.

SIR,—I beg to acknowledge receipt of your favour of 8th inst.

I greatly deplore the unwillingness of your Society to undo a great wrong done.

Dr. Moritz' opinions are opposed to the facts, as may be easily put to the proof. The *whole* of *The Champion* grain is still open to inspection. Any honest man can at once come to a conclusion in the matter.

You quote his *opinions*. I contest his facts as given in the following sentence (JOURNAL, R. A. S. E., p. 789):—"In the sample of the First Prize Barley (Northampton) I find 50 per cent. of such [cut] corns." Of his improper reference both to *The Champion* barley and to the Brewers' Exhibition, I say nothing save that an Editor of *The Brewing Trade Review* should know better.

As you refer to the Report on the barley at the Brewers' Exhibition signed by me as Chairman of the Judges, permit me to direct your attention to the third paragraph, wherein notice is taken of the extraordinary misstatement of facts appearing in your Society's Journal which meets with our (the Judges) direct contradiction. We expressly state: "The majority of the samples of grain exhibited were very properly and carefully dressed—many did not show a single defect"; whilst in a later paragraph we point out *some* were too closely dressed, and urge the desirability of attention being given to the matter. We do not admit the general application of censure, and in the one particular instance selected by Dr. Moritz of the Champion Grain, his statement is untrue.

Your obedient servant,
(Signed) H. STOPES.

Sir Ernest Clarke,
13 Hanover Square, W.

Chemical and Woburn.

Mr. STANYFORTH (Chairman) reported that the Committee had agreed to make experiments upon the use of salt for barley crops, and, on the motion of Mr. Pell, had decided to recommend the institution of experimental inquiries in regard to the growth and multiplication of plants injurious to Agriculture in particular localities, with the object of discovering practical means for checking such growth or prevalence. Dr. Voelcker had reported the progress of the bullock and sheep feeding, and field experiments at Woburn, and had presented the following Report on cases of adulteration, which the Committee recommended for publication in the usual manner:—

COFFEE HUSKS AS AN ADULTERANT.

The occurrence of a new form of adulteration of feeding-cakes, viz. by the use of the husks or "parchment" skin of the coffee berry, a quite worthless feeding material, was noted in former reports (April and November, 1898). Cases still occur which show that this adulteration continues, and that farmers must be on their guard against it.

Common or undecorticated cotton-cake seems to be a favourite medium for the employment of the admixtures, as the presence of the coffee husks in it is only with difficulty detected. It is not unfrequently found also as a constituent of mixed feeding-cakes.

(*a*) A member of the Society sent for analysis, on November 15, 1898, a sample of a 5-ton lot of cotton-cake, forming part of a contract made in August for 10 tons at 4*l.* 10*s.* per ton delivered. The invoice was for "10 (ten) tons cotton-cake." The report of Dr. Voelcker upon the cake was :—

"This cake is an adulterated one. It contains admixture of starch, coffee husks, and several kinds of weed seeds." The member said he questioned the vendor strongly about the cake, and was assured that it was pure and of the best quality.

(*b*) Another instance of feeding-cake adulterated with coffee husk, refuse grain, and sweepings is the following sample, on which Dr. Voelcker's report was :—

January 3, 1899.

Moisture	11·83
Oil	2·07
* Albuminous compounds (flesh-forming matters)	13·37
Starch, sugar, and digestible fibre	52·12
Woody fibre (cellulose)	12·67
† Mineral matters (ash)	7·94
	100·00
* Containing nitrogen	2·14
† Containing sand	4·29

"A dirty, inferior cake, composed largely of coffee husks, with refuse grain and sweepings. It contains rice, husk, polygonum, cockle, rape, and other weed seeds, with 4½ per cent. of sand."

SCREENINGS OF GRAIN USED AS CATTLE FOOD.

A member of the Society submitted a sample of what he proposed to give to fattening bullocks and milking cows. It was offered to him at 55*s.* per ton. Examination of it showed that it was nothing but the screenings of corn, and was just a collection of weed seeds. In large amount were cockle seed, polygonum, spurry, wild mustard, &c. It is most injudicious to use refuse of this kind, to say nothing of paying 55*s.* a ton for it. In addition to possible harm that may arise from the presence of injurious seeds, there is the likelihood of the weed seeds passing into and being scattered over the manure, and so fouling the land. The sender *did* mention that he thought the material had "scoured" the cattle when fed freely.

"AGRICULTURAL" SULPHATE OF COPPER.

Attention has been drawn previously to a case in which an article called "Vitriol for wheat-dressing," and composed merely of sulphate of iron coloured with Prussian blue, was made up to represent the genuine "blue stone" or sulphate of copper, so generally used for dressing seed corn against smut. It would now appear that an article called "agricultural sulphate of copper" is prepared especially for the farmer's use, and that he will have to be specially careful to see that what he purchases, and pays the price of sulphate of copper for, is the genuine article, and not the so-called "agricultural" sulphate of copper.

A member of the Society went to a local pharmaceutical chemist and asked for sulphate of copper. He purchased 20 lb., and paid 3*d.* per lb. cash, this being then about the current retail price (28*s.* per cwt.) for genuine sulphate of copper. Analysis of a sample sent me showed, however, its composition to be—

Sulphate of iron	90·94
Sulphate of copper	9·02
Insoluble matter	·04
	100·00

Statements were made in the correspondence which ensued to the effect that commercial sulphate of copper is an article of very variable composition, and the quality of which no maker will guarantee. This is erroneous and misleading. On the contrary, commercial pure sulphate of copper is a well-known and recognised article, sold on a basis of containing 98 per cent. crystallised sulphate of copper. The retail price of this was at the time about 28*s.* per cwt., whereas sulphate of iron costs only about 4*s.* per cwt.

(Signed) J. AUGUSTUS VOELCKER.

February 28, 1899.

Botanical and Zoological.

Mr. WHITEHEAD (Chairman) reported that the Committee had concurred in a recommendation of the Journal Committee that an article on vegetable poisons should be written for publication in the Society's Journal. They suggested that with a view to the greater equalisation of the work of the Council, the control of the Society's grass experiments, and of any inquiries that might be decided upon with regard to weeds or injurious plants, should in future be delegated to that Committee.

Mr. WHITEHEAD explained the circumstances under which the Botanical Committee thought it desirable that certain transferences of duties should be made, and said that his Committee's recommendations had the approval of the Chairman of the Chemical Committee, who had been present at their discussion.

Mr. PELL said he quite agreed with the remarks which had fallen from Mr. Whitehead. A case in point had arisen yesterday at the Journal Committee upon the question of poisonous plants, and, at his in-

stigation, it had been referred to the Botanical Committee, though at the same time he thought it ought also to be considered by the Veterinary Committee. It was said, on high botanical authority, that the rhododendron was poisonous. He understood this to be actually the case with regard to a small variety, grown on Swiss mountains, but that kind was not grown in this country. He ventured to suggest that this matter should be referred to the Veterinary Committee, in order that the opinion of Sir George Brown might be obtained.

Sir GEORGE BROWN said the question of the possible poisonous influence of plants upon animals was not one of opinion, but of experience or experiment. Certain wild plants were known to possess injurious properties, such as the *Colchicum autumnale*, the acorn in certain seasons, and the yew. As to all those plants they had definite proof of their poisonous nature. In any doubtful case, the course would be to call upon the botanical authorities to identify the plant, and then for the matter to be dealt with by the veterinarian.

Mr. MARTIN asked at what time of the year acorns were poisonous.

Sir GEORGE BROWN: In general, early in the autumn, before they are quite ripe, and when a high wind has caused them to fall before their time. This happens chiefly in dry years, when pasture is stunted and herbage scanty.

After some further discussion,

Mr. WHITEHEAD said that the Botanical Committee would undertake to consider this matter, and also—as he gathered that the Chemical Committee would have no objection—the points raised by Mr. Pell relative to experimental inquiries as to checking the growth or prevalence of plants injurious to Agriculture. He would be very glad if Mr. Pell would kindly assist in their deliberations on these subjects by becoming a member of the Botanical Committee.

Mr. PELL having expressed his willingness to serve, he was formally added to the Botanical Committee on the motion of Mr. WHITEHEAD, seconded by Mr. ASHWORTH.

Veterinary.

Mr. ASHWORTH reported that the Society's leaflet on "Tuberculosis in Dairy Stock" had been printed, and that several thousands of copies had been circulated. As applications for the leaflet were being received daily, it had been decided to issue a reprint at once, with some minor modifications. The Committee had considered and approved of the recommendations of Sir George Brown as to the veterinary arrangements for the Maidstone Meeting, and had appointed the Veterinary Inspectors.

Professor McFadyean had presented the following report:—

ANTHRAX.—The outbreaks notified during the first seven weeks of this year number seventy, and the animals attacked 104. These figures compare favourably with the corresponding period of last year, when the outbreaks were eighty-one, and the animals attacked 131.

GLANDERS.—There has recently been a distinct decline in the number of outbreaks of this disease reported. During the first seven weeks of this year eighty-six outbreaks, with 155 animals attacked, were notified, the figures for the corresponding period of last year being 123 and 234 respectively.

PLEURO-PNEUMONIA AND RABIES.—No case of either of these diseases has been reported during the current year.

SWINE FEVER.—The outbreaks for the past seven weeks number 313, against 287 for the same period of 1898.

MISCELLANEOUS.—During the month of February morbid specimens from thirty-four cases were sent to the Research Laboratory at the Royal Veterinary College for examination. These included cases of anthrax, tuberculosis, glanders, pneumonia, calf diphtheria, tumours, &c. The specimens also included the carcasses of two dogs which had died after exhibiting symptoms of intense gastro-enteritis. The post-mortem examination and the history of these cases indicate that the animals in question had been affected with a hitherto unnamed disease of the dog which prevailed in several places on the continent of Europe during 1898, and occasioned very numerous deaths. Experiments are being made with the object of ascertaining the cause of it. Reports show that a great many dogs have died from the disease in Bristol during the last few weeks.

Stock Prizes.

Sir JACOB WILSON reported that the Committee had considered the exhibition of pigs at Maidstone in view of the County of Kent being scheduled as a "swine movement district," and, as the circumstances were exactly similar to those at Birmingham last year, they recom-

mended that the same steps be taken with regard to the notice to be sent out to exhibitors of pigs. The Committee gave notice that they would ask for a vote of 5,000*l.* for prizes to be offered at the York Meeting of 1900.

Judges' Selection.

Sir JACOB WILSON reported that the gentlemen who had been invited to act as Judges in the several departments of the Maidstone Meeting had, with very few exceptions, accepted the Society's invitation. Arrangements had been made for the completion of the list forthwith, and also for its publication in the forthcoming number of the Journal, to be issued on March 31.

Implement.

Mr. FRANKISH (Chairman) reported that a Sub-Committee had been appointed to consider the entries and to allot the space for implements at the Maidstone Meeting. The Committee recommended the admission of plant for the manufacture of acetylene gas for exhibition at the Society's Country Meetings, under certain restrictions; and had settled various matters relative to the exhibition of implements at Maidstone. They had further considered the question of the trials of implements at York.

Showyard Works.

Sir JACOB WILSON (Chairman) reported that the levelling of the showyard and the construction of the sleeper roads at Maidstone were in a forward state, and that the erection of the buildings and the fencing of the yard were being proceeded with. Various details connected with the showyard had been considered and settled.

General Maidstone.

Mr. CORNWALLIS, M.P., reported that the Committee recommended the opening of the showyard on Monday, June 19th, at 8.30 A.M., and on the other days of the meeting at the usual hour. The question of railway arrangements had again been discussed, and the Local Committee had undertaken to urge the railway companies as to the provision of an early special train for the Judges, and also to facilitate the running of excursions from the Midlands and North of England. The cab fares at Maidstone had been settled at 2*s.* 6*d.* for a four-wheeled, and 2*s.* for a two-wheeled vehicle, between the stations and the showyard; the charge for a seat in a brake being 6*d.* each person.

Selection.

The report of this Committee having been read,

Sir JOHN THOROLD (Chairman) formally moved, "That Mr. R. C. Assheton, of Downham Hall, Clitheroe, be elected a member of the Council."

Mr. ASHWORTH said he had great pleasure in seconding the election of Mr. Assheton. There was at present no member of Council in the Clitheroe country, and as Mr. Assheton was quite a leading man in that district his election would be very popular in every part of the county. He felt sure, also, that Mr. Assheton would be able to nominate a considerable number of new members for the Society.

Sir NIGEL KINGSCOTE said that, as Chairman of the Finance Committee, he was glad to hear this, as it was obvious that with so large a membership there must always be, through deaths and resignations, a great many gaps to be filled up, and the continuance of the Society's operations upon their present scale depended upon the maintenance of their membership by the constant accession of new subscribers. For this they must, of course, chiefly rely upon the exercise of the influence of members of Council in their respective districts.

The motion for Mr. Assheton's election was then put and carried unanimously.

Presidency for 1900.

Sir JOHN THOROLD added that the Committee of Selection had had under consideration the question of the Presidency for next year, and were unanimously of opinion that it would be highly gratifying to the members of the Society at large, and especially to the agriculturists of Yorkshire and the North of England, if His Royal Highness the Prince of Wales should be pleased to accept the Presidency for the ensuing year, when their annual meeting would be held in the City of York. (Applause.)

The PRESIDENT said that if, as he felt sure would be the case, it should be the wish of the Council that the pleasure of the Prince of Wales should be ascertained on the subject, he would be happy to approach His Royal Highness with an expression of the unanimous desire and earnest hope of the Council that His Royal Highness would graciously consent to add to his many favours to the Society by accepting the Presidency for 1900. (Cheers.)

[Since the meeting of the Council the Earl of Coventry has received a personal letter from H.R.H. the Prince of Wales, consenting to accept the Presidency of the Society for the year 1900, "in order to show the great interest which he takes in everything relating to Agriculture."]

Education.

Mr. DUGDALE reported that the delegates appointed by the Society to discuss the arrangements for a joint examination for a National Diploma in Agriculture had met the representatives of the Highland and Agricultural Society, and they had arrived at a general agreement in the matter. The draft regulations and syllabus were now being prepared. Several points had been discussed and settled as to the Society's examinations in Agriculture and in Dairying for 1899.

Dairy.

Mr. DUGDALE (Chairman) reported that the Committee recommended the reduction of the prices of admission to the stand at the Dairy to 6*d.* and 3*d.* at the Maidstone Meeting. The programme of the demonstrations had been discussed, and various details connected with the trials of cream separators had been approved.

Miscellaneous.

Various letters and other documents having been laid upon the table, the Council adjourned, in view of Easter, until Wednesday, March 29th, 1899.

LIST OF JUDGES

IN THE SEVERAL CLASSES AT THE

MAIDSTONE MEETING, JUNE 17 TO 23, 1899.

IMPLEMENTS.

Machines for Washing Hops.
Class I.

WILLIAM CHAMBERS, Northfleet, Gravesend.
MONTAGU C. A. TAYLOR, Shelsley Walsh, Worcester.

Cream-separators.
Classes II. & III.

DOUGLAS GILCHRIST, University Extension College, Reading.
R. M. GREAVES, Wern, Portmadoc, North Wales.

Machines for the Evaporation of Fruit and Vegetables.—*Class* IV.

WILLIAM CHAMBERS, Northfleet, Gravesend.
BAYNTON HIPPISLEY, Ston Easton Park, Bath.
MONTAGU C. A. TAYLOR, Shelsley Walsh, Worcester.

Packages for the Carriage of Fruit.
Classes V. & VI.

WILLIAM CHAMBERS, Northfleet, Gravesend.
FREDERICK FISHER, 12 Botolph Lane, E.C.
MONTAGU C. A. TAYLOR, Shelsley Walsh, Worcester.

Miscellaneous Implements.
(*Entered for Silver Medals*)

CHARLES P. HALL, Park Farm, Woburn, Beds.
BAYNTON HIPPISLEY, Ston Easton Park, Bath.

HORSES.

Hunters.—*Classes* 1, 3, 5, 6, 7.

JOHN COOPER, Brook Hill, East Haddon, Northampton.
Hon. ALEXIS ROCHE, Old Court, Doneraile.

Hunters.—*Classes* 2, 4, & 8–11.

HENRY BODEN, The Friary, Derby.
Hon. ALEX. E. PARKER, Estate Office, Culford, Bury St. Edmunds.

Cleveland Bays and Coach Horses.
Classes 12–15.

GEORGE BURTON, Thorpe Willoughby, near Selby.
GEORGE SCOBY, Beadlam Grange, Nawton, York.

Hackneys.—*Classes* 16–23.

JOSEPH MORTON, Stow, Downham Market.
T. D. REED, Beeford Grange, Hull.

Ponies, Harness Horses and Ponies.
Classes 24–27 & 40–42.

EDWARD MUCKLOW, jun., Wood Hill, Bury, Lancashire.
ROMER WILLIAMS, Norfolk House, Thames Embankment, W.C.

Shetland, Mountain and Moorland, and Polo Ponies.—*Classes* 28–39.

JONATHAN P. BAIRD, Castlemains, Douglas, Lanarkshire, N.B.
Earl of HARRINGTON, Elvaston Castle, Derby.

Shires and Agricultural.
Classes 43–49, 63 & 64.

A. H. CLARK, Moulton Eaugate, Spalding.
JOHN NIX, Stud Farm, Alfreton, Derbyshire.

Clydesdales.—*Classes* 50–56.

DAVID BUCHANAN, Garscadden Mains, N.B.
JOHN M. MARTIN, 32 Ann Street, Edinburgh.

Suffolks.—*Classes* 57–62.

HERMAN BIDDELL, Playford, Ipswich.
W. H. HEWITT, West Hill, Copdock, Ipswich.

CATTLE.

Shorthorns.—*Classes* 65–71.

T. H. HUTCHINSON, Manor House, Catterick, Yorks.
JOSEPH STRATTON, Wick Down, Swindon, Wiltshire.

Herefords.—*Classes* 72–78.

G. H. GREEN, Wigmore Grange, Leintwardine, R.S.O.

J. H. YEOMANS, Stretton House, Hereford.

Devons.—*Classes* 79–84.

W. S. PERRY, Crelake, Tavistock, Devon.

F. W. SHUKER, Scorrier, Cornwall.

Sussex.—*Classes* 85–91.

ALFRED HEASMAN, Court Wick, Littlehampton.

DANIEL SWAFFER, Bond Farm, Kingsnorth, near Ashford, Kent.

Longhorns.—*Classes* 92 & 93.

G. H. GREEN, Wigmore Grange, Leintwardine, R.S.O.

W. W. SWINNERTON, Stivichall Grange, Coventry.

Welsh.—*Classes* 94–98.

EVAN EVANS, Maesmynach, Llanybyther, Carmarthen.

WILLIAM JONES, Llyngwyn, Chwilog R.S.O., Carnarvon.

Red Polled and Aberdeen Angus.
Classes 99–108.

D. F. SMITH, Steward's Office, Easton Park, Wickham Market.

WILLIAM WHYTE, Spott, Kirriemuir, N.B.

Galloways and Ayrshires.
Classes 109–118.

THOMAS KERR, Kirkchrist, Kirkcudbright, N.B.

WILLIAM PARKIN-MOORE, Whitehall, Mealsgate, Cumberland.

Jerseys.—*Classes* 119–123.

J. F. HALL, Sharcombe, Wells, Somerset.

F. C. STARKIE, Oakwood, Otterbourne, Winchester.

Guernseys.—*Classes* 124–128.

CHARLES A. BARNES, Solesbridge, Rickmansworth.

Hon. and Rev. ARTHUR BAILLIE-HAMILTON, Les Quartiers, Guernsey.

Kerries and Dexters.
Classes 129–132.

LUKE CHRISTY, Carrigeen, Croom, co. Limerick.

Major LIONEL HEWSON, Direen, Kenmare, co. Kerry.

Dairy Cattle.—*Classes* 133–135.

THOMAS EASTON, The Old Hall, Casterton, Kirkby Lonsdale.

ARTHUR STRETTON, Wichnor, Burton-on-Trent.

SHEEP.

Leicesters.—*Classes* 136–140.

DAVID LINTON, Low Street Brewery, Bedale, Yorks.

W. H. TREMAINE, Sherborne, Northleach, R.S.O., Glos.

Cotswolds.—*Classes* 141–145.

ROBERT JACOBS, Eynsham, Oxfordshire.

THOMAS THORNTON, Cavenham House, Wereham, Stoke Ferry.

Lincolns and Devon Long-wools.
Classes 146–151, 189 & 190.

HENRY GOODYEAR, Austerby, Bourne, Lincolnshire.

C. W. TINDALL, Wainfleet, Lincolnshire.

Oxford Downs.—*Classes* 152–156.

GEORGE ADAMS, Wadley House, Faringdon, Berkshire

JOHN BRYAN, Southleigh, Witney, Oxon.

Shropshires. (Rams.)
Classes 157–159.

JOSEPH BEACH, The Hattons, Wolverhampton.

HARRY WILLIAMS, Newton-on-the-Hill, Shrewsbury.

Shropshires. (Ewes.)
Classes 160 & 161.

A. S. BERRY, Pheasey Farm, Great Barr, Birmingham.

P. A. EVANS, Sherlowe, Wellington, Shropshire.

Southdowns.—*Classes* 162–167.

CHARLES O. NEWMAN, Charlton, Chichester.

RICHARD RELFE VERRALL, Falmer, Lewes, Sussex.

Hampshire Downs.—*Classes* 168–172.

T. A. EDNEY HAYTER, The Mount, Whitchurch, Hants.

FRANK R. MOORE, Littlecott, Upavon, Marlborough.

Suffolks.—*Classes* 173–177.

J. C. DAWSON, Nacton, Ipswich.
JOSEPH FLINTHAM, The Hall Farm, Aldeburgh-on-Sea.

Border Leicesters and Cheviots.
Classes 178–180, 193 *&* 194.

A. PETERKIN HOPE, Sunwick, Berwick-on-Tweed.
J. R. MARSHALL, Chatton Park, Belford.

Kentish or Romney Marsh.
Classes 181–186.

FRANCIS DE B. COLLARD, Minster Abbey, Ramsgate.
THOMAS POWELL, East Lenham, Maidstone.

Wensleydales.—*Classes* 187 *&* 188.

AARON EWAN, Gooda, Westhouse, Kirkby Lonsdale.
J. O. TROTTER, Holtby Grange, Bedale, Yorks.

Somerset and Dorset Horned.
Classes 191 *&* 192.

JOHN CHICK, Compton Valence, Dorchester.
SAMUEL KIDNER, Bickley, Milverton, Somerset.

Black-faced Mountain, Herdwicks & Welsh.—*Classes* 195–200.

JAMES MACFARLANE, Elibank, Walkerburn, Peeblesshire.
JOHN V. WILLIAMSON, Derwen Hall, Corwen.

PIGS.

Whites.—*Classes* 201–212.

JOHN ANGUS, Whitefield, Morpeth, Northumberland.
PHILIP ASCROFT, Rufford, near Ormskirk.

Berkshires.—*Classes* 213–216.

ARTHUR HISCOCK, jun., Manor Farm, Motcombe, Shaftesbury.
T. S. MINTON, Montford, Shrewsbury.

Tamworths.—*Classes* 217–220.

EDWARD BURBIDGE, South Wraxall, Bradford-on-Avon.
JOHN WATTS, Fair Green, Chipping Norton, Oxon.

POULTRY.

Classes 221–316.

W. FORRESTER ADDIE, Estate Office, Powis Castle, Welshpool.
EDWARD BROWN, F.L.S., The Chestnuts, Theale, Berks.
EDWARD KENDRICK, Weeford House, Lichfield.
ARTHUR C. MAJOR, Park Farm Ditton, Langley, Bucks.
J. P. W. MARX, Basford, Nottingham.

PRODUCE.

Butter and Cream Cheese.

Classes 317–320; 326 *&* 327.

Miss M. JOHNSTONE, Rowridding, Broughton-in-Furness.
Miss WALSH, 4 Lonsdale Road, Barnes, S.W.

Cheese.—*Classes* 321–325.

H. HEWITT, 105 Victoria Street, Westminster, S.W.
G. W. OUBRIDGE, 5 & 7 Town Hall Buildings, Newcastle-on-Tyne.

Cider and Perry.—*Classes* 328–331.

H. C. BEDDOE, Castle Street, Hereford.

Hops.—*Classes* 332–337.

J. H. MEREDITH, 26 Sansom Street, Worcester.
STUART NEAME, 33 Borough High Street, S.E.

Preserved Fruits and Vegetables.
Classes 338–342.

FREDERICK FISHER, 12 Botolph Lane, E.C.
FREDERIC LAURENCE, 1 Somerfield Terrace, Maidstone.

Hives and Honey.—*Classes* 343–366.

Rev. G. W. BANCKS, Green Street Green, Dartford.
W. BROUGHTON CARR, 17 King William Street, W.C.
R. HAMLYN-HARRIS, Villa Rominger Tübingen, Germany.

HORSE-SHOEING COMPETITIONS.

HENRY G. LEPPER, M.R.C.V.S., Walton Street, Aylesbury

JOHN MALCOLM, F.R.C.V.S., Holliday Street Wharf, Birmingham.

VETERINARY INSPECTORS.

Professor Sir GEORGE BROWN, C.B., Bryn Hyfryd, Harrow.

W. BOWER, M.R.C.V.S., East Rudham, Swaffham.

C. CROWHURST, M.R.C.V.S., Maidstone.

PERCY GREGORY, M.R.C.V.S., Tonbridge, Kent.

H. G. LEPPER, M.R.C.V.S., Walton Street, Aylesbury.

Professor JAMES MCQUEEN, F.R.C.V.S., Royal Veterinary College, Camden Town, N.W.

JOHN MALCOLM, F.R.C.V.S., Holliday Street Wharf, Birmingham.

HARRY MOORE, M.R.C.V.S., Worksop, Notts.

JOHN M. PARKER, M.R.C.V.S., 40 Cannon Street, Birmingham.

HAROLD SESSIONS, M.R.C.V.S., Tongdean, Brighton.

WILLIAM WILSON, F.R.C.V.S., Great Berkhamstead, Herts.

OFFICIAL REPORTER.

W. FREAM, B.Sc., LL.D., 13 Hanover Square, London, W.

MAIDSTONE MEETING, 1899.

Closing of Entries for Live Stock, Poultry, and Farm Produce.

Exhibitors are reminded that the *final dates* for the receipt of *Entries* for the Maidstone Meeting will be as under:—

LIVE STOCK (Horses, Cattle, Sheep, Pigs):—

SATURDAY, APRIL 15, 1899, at **10s.** per Entry.
Monday, May 1, at **15s.** per Post Entry.
Monday, May 15 (last day), at **£1** per Late Entry.

POULTRY AND FARM PRODUCE:—

Monday, May 1, 1899, at **2s. 6d.** per Entry.
Monday, May 15 (last day), at **5s.** per Post Entry.

Double Fees throughout to Non-Members of the Society.

PRINCIPAL ADDITIONS TO THE LIBRARY DURING THE YEAR 1898.

[*The name of the Donor, or the mode of acquisition, appears in Italics after the title of each work.*]

ALINO, Bernardo Giner, Quimica Agricola; Tratado de Abonos. 8vo. Valencia, 1898..*Author*

Argentine Republic, Segundo Censo de la República Argentina. la. 4to. Buenos Aires, 1898..................*Com. Dir. del Censo Nac. Buenos Aires*

—— Collection of Agricultural and Statistical tracts relative to. *Ministerio de Obras Públicas de Buenos Aires*

BAILEY, L. H., The Principles of Fruit-Growing. 8vo. New York, 1897. *Purchased*

Baker, T., and Dixon, C. E., Land Surveying. 8vo. London, 1898...*Publishers*

Bavaria, Vierteljahrsschrift des bayerischen Landwirthschaftrathes. 8vo. München, 1897 ....*Bavarian Ministry*

Belgium, Exposé Statistique des Associations d'intérêt agricole pendant 1897. 8vo. Bruxelles, 1898 ....*M. Roost*

Board of Agriculture, The Agricultural State of the Kingdom. 8vo. London, 1816..*Purchased*

Bolton, H. C., Catalogue of Scientific and Technical Periodicals. 8vo. Washington, 1898 ....*Smithsonian Institution*

Bruce, Robert, Food Supply. 8vo. London, 1898 ....*Publishers*

CANADA, Royal Society of, Transactions. 8vo. Toronto, 1895–7.........*Society*

Chambers of Agriculture, Report on Co-operation for the Sale of Produce. 8vo. Westminster, 1898 ....*Chambers of Agriculture*

Coghlan, T. A., The Wealth and Progress of New South Wales. 8vo. Sydney, 1897 ....*Agent-General of N.S.W.*

Cousins, H. H., Chemistry of the Garden. 12mo. London, 1898 ...*Publishers*

Cox, Michael F., Notes of the History of the Irish Horse. sm. 4to. Dublin, 1897 ....*Author*

DETMER, W., Practical Plant Physiology, trans. S. A. Moor. 8vo. London, 1898. *Publishers*

Deutsche Landwirtschafts-Gesellschaft. Jahrbuch. Band 13. 8vo. Berlin, 1898..*Gesellschaft*

—— Wanderausstellung zu Dresden, 30 Juni bis 5 Juli 1898. 8vo. Berlin, 1898 .... *Gesellschaft*

Dymond, T. S., Experimental Course of Chemistry. 8vo. London, n.d. *Publishers*

ENCYCLOPÆDIA BRITANNICA, The, a Dictionary of Arts, Sciences and General Literature. 9th ed. 25 vols. 4to. London, 1875–89 ......*Purchased*

English Dialect Dictionary. Part V. 4to. London, 1898............*Purchased*

Eriksson, Prof. Dr. Jakob, und Henning, Dr. Ernst, Die Getreideroste, sowie Massregeln gegen dieselben. 8vo. Stockholm, n.d...............*Authors*

—— Collection of Tracts, chiefly in German, on the subject of Grain Rust. 8vo. 1895–8. ....*Author*

—— Review of Results of Swedish Research into Grain Rust. 8vo. Chicago, 1898 ....*Author*

Ertl, Dr. Moriz, and Licht, Dr. Stefan, Das landwirtschaftliche Genossenschaftwesen in Deutschland. 8vo. Wien, 1899....................*Authors*

FLEMING, George, The Wanton Mutilation of Animals. 4to. London, 1898. *Author*

Flock-Books:—

Cotswold Flock-Book. Vol. VII. 8vo. Cirencester, 1898 ....*Society*

Hampshire Down Flock-Book. Vol. IX. 8vo. Salisbury, 1898 ......*Assoc.*

Kent or Romney Marsh Flock-Book. Vol. IV. 8vo. London, 1898 ...*Assoc.*
Leicester Flock-Book. Vol. VI. 8vo. Hull, 1898 ....*Assoc.*
Lincoln Long-Wool Flock-Book. Vol. VII. 8vo. Lincoln, 1898......*Assoc.*
Oxford Down Flock-Book. Vol. X. 8vo. Lond., 1898 ....*Assoc.*
Roscommon Flock-Book. Vol. III. 8vo. Dublin, 1898 ....*Assoc.*
Suffolk Sheep Flock-Book. Vol. XII. 8vo. Ipswich, 1898 ....*Society*
Wensleydale Long-Wool Flock-Book. Vol. IX. 8vo. Bedale, 1898...*Society*

Fowler, J. K., Records of Old Times. 8vo. London, 1898............*Publishers*

Frank, Dr. A. B., Manual of Agricultural Botany, trans. J. W. Paterson. 8vo. Edinburgh, 1898 ....*Publishers*

GREENWICH Observatory. Results of Magnetical Observations, by W. H. M. Christie. 8vo. London, 1897 ....*Royal Observatory, Greenwich*

Guntz, Max, Handbuch der landwirthschaftlichen Litteratur. 8vo. Leipzig, 1897 ....*Author*

Guthrie, F. B., Pamphlets on various Subjects relating to Agricultural Chemistry. 8vo. v.p. and v.d. ....*Author*

HAENTJENS, A., and Versnick, L., Monographie de la Laiterie Coopérative. 8vo. Louvain, 1897 ....*Authors*

Hansen, J., and Günther, A., Versuche über Stallmist-Behandlung. 8vo. Berlin, 1898 ....*Purchased*

Herd-Books:—

Ayrshire Herd-Book. Vols. XX. and XXI. 8vo. Ayr, 1897-8...*Association*
British Berkshire Herd-Book. Vol. XIV. 8vo. Abingdon, 1898...*Association*
Coates' Herd-Book. Vol. XLIV. 8vo. London, 1898......*Shorthorn Society*
Davy's Devon Herd-Book. Vol. XXI. 8vo. Exeter, 1898 ....*Society*
English Jersey Herd-Book. Vol. IX. 8vo. London, 1898 ....*Society*
Kerry and Dexter Herd-Book. Vol. VII. 8vo. Dublin, 1899...*Roy. Dublin Soc.*
Long Horn Herd-Book. Vol. I. 8vo. Birmingham, n.d....*Mr. W. H. Lythall*
National Pig Breeders' Herd-Book. Vol. XIV. 8vo. Nottingham, 1898...*Assoc.*
Polled Herd-Book. (Aberdeen-Angus.) Vol. XXII. 8vo. Banff, 1898...*Society*

Highland and Agricultural Society, Transactions. 5th ser. Vols. X. and XI. 8vo. Edinburgh, 1898-9..*Society*

INDIA, Agricultural Statistics of British India for the years 1892-3 to 1896-7. fol. Calcutta, 1898 ....*Supt. of Govt. Printing*

JERSEY Cattle Society. Jersey Cattle, their Feeding and Management. 8vo. London, 1898 ....*Society*

KIRBY, W. E. and W. F., Insects. 8vo. London, 1898 ....*Publishers*

König, Dr. J., Untersuchung landwirthschaftlich und gewerblich wichtiger Stoffe. 2te Auflage. 8vo. Berlin, 1898...........................*Purchased*

LANDWIRTSCHAFTLICHES Tieralbum. Obl. 8vo. Berlin, 1899......*Purchased*

Lawes, Sir John B., and Gilbert, Sir J. Henry, The World's Wheat Supply. 8vo. London, 1898 ....*Authors*

—— Rothamsted Memoranda. 8vo. London, 1898........................*Authors*

Legge, T. M., and Sessions, Harold, Cattle Tuberculosis. 8vo. London, 1898. *Publishers*

Local Government Directory for 1898. 8vo. London, 1898. ....*Purchased*

MCCORMICK, R., Memorial of. 8vo. Chicago, 1885; repr. '98...*Mr. J. F. Steward*

M'Culloch, J. R., Dictionary of Commerce. 2nd ed. 8vo. Lond., n.d...*Purch.*

Maine Board of Agriculture, Fortieth Annual Report; Agricultural Experiment Station, Thirteenth Annual Report. 8vo. Augusta, 1898...*Board*

Markham, Gervase, Maison Rustique, or, The Covntrey Farme. Compyled in the French Tongue by Charles Stevens, and Iohn Liebault, Doctors of Physicke. And translated into English by Richard Surflet, Practitioner in Physicke. Now newly Reviewed, Corrected, and Augmented, with

diuers large Additions out of the Husbandrie of France, Italie, and Spaine, by Gervase Markham. fol. London, 1616 ....*Purchased*
Massachusetts, Report of the State Board of Agriculture. 8vo. Boston, 1898. *Board*
Mayer, Adolf, Die Ernährung der landwirtschaftlichen Kulturpflanzen. 2te Auflage. 8vo. Berlin, 1898 ....*Purchased*
Michigan, Thirty-Fifth and Thirty-Sixth Annual Reports of State Board of Agriculture. 8vo. Lansing, 1897–8................. *Board of Agriculture*
Mitchell, G. S., Handbook of Land Drainage. 8vo. London, 1898......*Author*
Mucke, Joh. Richard, Urgeschichte des Ackerbaues und der Viehzucht. 8vo. Greifswald, 1898 ....*Purchased*

Nasse, E., Agricultural Community of the Middle Ages. Trans. H. A. Ouvry. 8vo. London, 1871 ....*Purchased*
National Wheat Stores, Report of the Agricultural Committee on. fol. London, 1897–8 ....*Committee*
Nettleship, J. T., George Morland. 8vo. London, 1898...............*Purchased*
New Hampshire, Report of the Board of Agriculture. Vols. X.–XXIV. 8vo. Concord, Manchester, 1881–97 ....*Board*
Nicholls, Sir G., History of the English Poor Law. Ed. H. G. Willink. 2 vols. 8vo. London, 1898 ....*Publishers*
Nocard, Ed., and Leclainche, E., Maladies Microbiennes des Animaux. 8vo. Paris, 1898 ....*Authors*
North Carolina Agricultural Experiment Station, Report for 1897. 8vo. Raleigh, 1898 ....*Station*

Ontario Bureau of Industries, Appendix to Report. 8vo. Toronto, 1898. *Bureau*
Ormerod, E. A., Observations of Injurious Insects during 1897. 8vo. London, 1898 ....*Author*
—— Handbook of Insects injurious to Orchard and Bush Fruits. 8vo. London, 1898 ....*Author*

Parliamentary Papers, &c.:—

Agricultural Returns, Statistical Tables, showing acreage under crops. 8vo. London, 1898 ....*Board of Agriculture*
Agricultural Returns for Great Britain for 1897. 8vo. London, 1898. *Board of Agriculture*
Agricultural Statistics, Ireland, Tables for 1897. fol. Dublin, 1898. *Irish Land Commission*
Annual Report of Distribution of Grants for Agricultural Education. 8vo London, 1898 ....*Board of Agriculture*
Annual Reports of Proceedings under the Diseases of Animals Acts. 8vo. London, 1898 ....*Board of Agriculture*
Annual Statement of the Trade of the United Kingdom. fol. London, 1898. *Board of Trade*
Board of Agriculture Journal. Vol. V. 8vo. Lond., 1898...*Board of Agriculture*
Board of Trade Journal. Vols. XXIV. and XXV. 8vo. London, 1898. *Board of Trade*
Consular Reports, 1898. 8vo. London, 1898 ....*Purchased*
Report of Commissioners appointed to inquire into use of Meat and Milk of Tuberculous Animals. fol. London, 1898 ....*Purchased*
Report of the Committee appointed to inquire into the Inland Transit of Cattle. fol. London, 1898.............................*Board of Agriculture*
Report of the Irish Land Commissioners. April 1, 1897, to March 31, 1898. fol. Dublin, 1898.....................................*Irish Land Commission*
Statistical Abstract for the United Kingdom, xlv., 1883–1897. 8vo. London. 1898 ....*Board of Trade*
Statistical Abstract for the Several Colonial and other Possessions of the United Kingdon, xxv., 1883–97. 8vo. London, 1898 ...*Board of Trade*

Statistical Abstract for the Principal and other Foreign Countries, xxiv., 1886–97. 8vo. London, 1898 ....*Board of Trade*

Trade and Navigation Accounts for each month during the year 1898. 8vo. London, 1898 ....*Board of Trade*

PACKARD, Alpheus S., Text Book of Entomology. 8vo. New York, 1898. *Purchased*

Pease, J. G., and Chitty, Herbert, Law of Markets and Fairs. 8vo. London, 1899................................*Purchased*

Petermann, A., Recherches de Chimie et de Physiologie. Tome III. 8vo. Paris, 1898 ....*Author*

QUEENSLAND, Annual Report of the Department of Agriculture. 8vo. Brisbane, 1897 ....*Department*

REMY, Th., Untersuchungen über das Kalidüngerbedurfnis der Gerste. 8vo. Berlin, 1898 ....*Purchased*

Rochford, Thomas, Lettre-circulaire sur le Développement obtenu en augmentant la Production de la Terre. la. 8vo. n.p. 1898 .... *Author*

Roux, E., Les Engrais. 8vo. Paris, 1898................................*Purchased*

Royal Agricultural College, Cirencester, Register of the Staff and Students. 8vo. Cirencester, 1897 ....*Mr. Charles Bathurst*

SCHLESWIG-HOLSTEIN, Jahresbericht der Landwirthschaftskammer. 8vo. Kiel, 1898 ....*Landwirthschaftskammer*

Self-Propelled Traffic Association, Liverpool Trials, Judges' Report. 8vo. Liverpool, 1898 ....*Association*

Shaw, William, and Corbet, Henry, Tenant Right. 8vo. London, 1849. *Purchased*

Simonds, Jas. Beart, Biographical Sketch of W. J. T. Morton. 8vo. London, 1898 ....*Author*

Smith, Henry Herbert, Principles of Landed Estate Management. 8vo. London, 1898................................*Purchased*

Smith, Worthington G., Diseases of Field and Garden Crops. sm. 8vo. London, 1884................................*Purchased*

Smithsonian Institution, Annual Report for 1896. 8vo. Washington, 1898 *Institution*

Society for the Protection of Agriculture, Tracts, 8vo. London, [1844] *Purchased*

Steinacker, Edmund, Zur Börsenreform in Ungarn. 8vo. Wien, 1899...*Author*

Stud-Books :—

Cleveland Bay Stud-Book. Vol. X. 8vo. Northallerton, 1898 ......*Society*

Clydesdale Stud-Book. Vol. XX. 8vo. Glasgow, 1898 ....*Society*

Shire Horse Stud-Book. Vol. XIX. 8vo. London, 1898 ....*Society*

THOMS, Prof. Dr. Georg, Die Versuchs- und Samen-Control-Station zu Riga. 8vo. Riga, 1898................................*Author*

Trigaut, J., Les Bibliothèques agricoles en Belgique. 8vo. Binche et Bruxelles, 1898 ....*Author*

Trinidad, Royal Botanic Gardens, Annual Report, by J. H. Hart. 8vo. Trinidad, 1898................................*Author*

Trotter, A. M., The Housing of Cattle. 8vo. Glasgow, 1898 ....*Author*

—— Tuberculosis a Preventible Disease. 8vo. Edinburgh, 1899 ......*Author*

Tull, Jethro, Horse Hoeing Husbandry, ed. Cobbett. 8vo. London, 1822. *Purchased*

UNITED States Department of Agriculture, Yearbook. 8vo. Washington, 1898 ....*Department*

—— Fourteenth Report of the Bureau of Animal Industry for 1897. 8vo. Washington, 1898 ....*Department*

VICTORIA, Government Handbook of. 8vo. Melbourne, n.d....... *Government*
Vuyst, Paul de, Notes sur l'Agriculture aux Etats-Unis. 8vo. Paris, 1898...*Author*

WAGNER, Paul, Düngungsfragen, IV. 8vo. Berlin, 1898. With other tracts on Artificial Manures by the same author..................*Mr. D. A. Louis*
Wallace, R. Hedger, The Adulteration of Dairy Produce. 8vo. Edinburgh, 1898 ....*Author*
Warington, Robert, Principles which should determine Compensation for Use of Foods and Manures. 8vo. London, 1898 ....*Author*
Watt, George, Pests and Blights of the Tea Plant. fol. Calcutta, 1898. *Office of Govt. Printing*
Weinzierl, Dr. Theodor Ritter von, Ueber die Zusammenstellung und den Anbau der Grassamen-Mischungen. 8vo. Wien, 1898...........*Author*
Wigan, Lewis D., The Rook. 8vo. Hawick, 1898..........................*Author*
Wisconsin, Agricultural Experiment Station, Fifteenth Annual Report. 8vo. Madison, 1898..*Station*
Worlidge, J., Vinetum Britannicum. 2nd ed. Sm. 8vo. London, 1678. *Purchased*

XENOPHON, The Art of Horsemanship, trans. M. H. Morgan. 8vo. London, 1894..*Purchased*

YOUNG, Arthur, Travels in France. 2 vols. 8vo. Dublin, 1793 ...*Purchased*
—— Autobiography. Ed. M. Betham-Edwards. 8vo. Lond., 1898...*Purchased*

The Society is indebted to numerous Government Departments, both at home and abroad, to Boards of Agriculture, Agricultural Societies, and kindred institutions, for copies of their Annual Reports, Journals, Proceedings, Transactions, Bulletins, and other documents received regularly for the Library in exchange for copies of the Journal, as well as to the Editors of many agricultural and general papers for the current numbers of their publications, which have been placed for reference in the Reading Room.

PRESENTATIONS OF PICTURES &c., TO THE SOCIETY DURING THE YEAR 1898.

COLLECTION OF ENGRAVINGS OF HANOVER SQUARE from 1717 to 1800. *Sir Walter Gilbey, Bart.*

HANOVER SQUARE. [A South view, showing Oxford St. in 1719, before the building of Cavendish Square.]

A VIEW OF ST. GEORGE'S CHURCH, HANOVER SQUARE.

A NORTH VIEW OF HANOVER SQUARE, London. Printed for Robt. Sayer, Print and Map-seller, at the Golden Buck in Fleet Street.

HANOVER SQUARE. [A South view.] Sutton Nicholls delin: et sculp:. Sold by John Bowles, Print and Map-seller over against Stocks Market.

[North] VIEW OF HANOVER SQUARE, from a Drawing in the possession of the Rt. Hon. Francis Godolphin, Marquis of Caermarthen. Drawn by E. Dayes. Published December 1, 1787, by R. Pollard and F. Jukes.

HANOVER SQUARE. Published July 28, 1800, by T. Malton. [A view of Harewood House from Oxford Street. The Square in the background.]

REPRESENTATION OF THE DINNER, given by Lord Romney, Lord Lieutenant of Kent, to the Kentish Volunteers, in the presence of their Majesties and the Royal Family. [Photograph of the print, showing the site in the Mote Park where the Review of the Kentish Volunteers was held in 1799. Upon this same spot the meeting of the Royal Agricultural Society will be held in 1899.] *Town Clerk of Maidstone.*

MEMORANDA.

ADDRESS OF LETTERS.—All letters on the general business of the Society should be addressed to "The SECRETARY, Royal Agricultural Society of England, 13 Hanover Square, London, W."

TELEGRAMS.—The Society's registered address for telegrams is "Practice, London." *Replies by Telegraph cannot be sent unless paid for in advance, and cannot be guaranteed in any case.*

TELEPHONE NUMBER, 3675, "Gerrard."

OFFICE HOURS.—10 to 4. On Saturdays, 10 to 2.

GENERAL MEETINGS in London: Monday, May 22, 1899 (*pro formâ*), in order to comply with Clause 6 of the Society's Charter—to be immediately adjourned until Monday, May 29, 1899, at noon; Thursday, December 7, 1899, at noon.

MONTHLY COUNCIL (for transaction of business), at noon on the first Wednesday in every month, excepting January, September, and October: open only to Members of Council and Governors of the Society.

SUBSCRIPTIONS.—1. *Annual.*—The subscription of a Governor is £5, and that of a Member £1, due in advance on the 1st of January of each year, and becoming in arrear if unpaid by the 1st of June.

2. *For Life.*—Governors may compound for their subscriptions for future years by paying on election, or at any time thereafter, the sum of £50, and Members by paying £15. Members elected before 1890 may compound at any time on payment of £10 in one sum; and Members elected in or subsequently to 1890 may compound for the same amount after the payment of ten annual subscriptions. Governors and Members who have paid their annual subscription for 20 years or upwards, and whose payments are not in arrear, may compound for future annual subscriptions, that for the current year inclusive, by a single payment of £25 for a Governor, and £5 for a Member. No Governor or Member can be allowed to enter into composition for life until all subscriptions due by him at the time shall have been paid.

No Governor or Member whose subscription is in arrear is entitled to any of the privileges of the Society.

All Members of the Society are, under the Bye-laws, bound to pay their annual subscriptions until they shall withdraw from it by notice in writing to the Secretary.

PAYMENTS.—Subscriptions may be paid to the Secretary, either at the office of the Society, No. 13 Hanover Square, London, W., or by means of crossed cheques in favour of the Secretary, or by postal orders, to be obtained at any of the principal post-offices throughout the kingdom, and made payable at the Vere Street Office, London, W. When making remittances it should be stated by whom, and on whose account, they are sent. All Cheques and Postal Orders should be crossed "London and Westminster Bank, St. James's Square Branch."

On application to the Secretary, forms may be obtained for authorising the regular payment, by the bankers of individual members, of each annual subscription as it falls due. Members are particularly invited to avail themselves of these Bankers' orders, in order to save trouble both to themselves and to the Society. When payment is made to the London and Westminster Bank, as the Bankers of the Society, it will be desirable that the Secretary should be advised by letter of such payment, in order that the entry in the bankers' book may be at once identified, and the amount posted to the credit of the proper person. No coin can be remitted by post, unless the letter be registered.

JOURNAL.—The Parts of the Society's Journal are (when the subscription is not in arrear) forwarded by post to Members, or delivered from the Society's Office to Members or to the bearer of their written order.

The back numbers of the Journal are kept constantly on sale by the publisher, Mr. JOHN MURRAY, 50A Albemarle Street, W.

NEW MEMBERS.—Every candidate for admission into the Society must be nominated by a Governor or Member, and must duly fill up and sign an application for Membership on the appointed form. Forms of Proposal may be obtained on application to the Secretary, who will inform new Members of their election by letter.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Proceedings of the Council.

WEDNESDAY, MARCH 29, 1899.

THE EARL OF COVENTRY (PRESIDENT) IN THE CHAIR.

Present:

Trustees.—Sir Walter Gilbey, Bart., Colonel Sir Nigel Kingscote, K.C.B.

Vice-Presidents. — The Duke of Bedford, the Earl of Feversham, Lord Moreton, Sir John Thorold, Bart., Mr. Charles Whitehead.

Other Members of Council.—Mr. J. H. Arkwright, Mr. Alfred Ashworth, Mr. R. C. Assheton, Viscount Baring, Mr. George Blake, Mr. J. Bowen-Jones, Mr. Victor C. W. Cavendish, M.P., Lord Arthur Cecil, Mr. F. S. W. Cornwallis, M.P., Mr. Percy Crutchley, Mr. A. E. W. Darby, the Earl of Derby, K.G., Mr. J. Marshall Dugdale, the Earl of Jersey, G.C.M.G., Captain W. S. B. Levett, Mr. C. S. Mainwaring, Mr. Henry D. Marshall, Mr. Joseph Martin, the Hon. Cecil T. Parker, Mr. Dan. Pidgeon, Mr. J. E. Ransome, Mr. Frederick Reynard, Mr. G. H. Sanday, Mr. Henry Smith, Mr. Martin J. Sutton, Mr. J. P. Terry, Mr. R. A. Warren, Mr. E. V. V. Wheeler, Mr. J. C. Williams, Sir Jacob Wilson.

Officers.—Sir Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. J. E. Compton-Bracebridge, Assistant Director; Mr. R. S. Burgess, Superintendent of the Showyard.

Professor Sir George Brown, C.B.

Mr. R. A. Hamilton Seymour, Secretary of the Maidstone Local Committee.

Apologies for non-attendance were received from H.R.H. Prince Christian, K.G., the Duke of Richmond and Gordon, K.G, Earl Cawdor, Earl Egerton of Tatton, Lord Brougham and Vaux, Mr. H. Chandos-Pole-Gell, Lieut.-Col. Curtis-Hayward, Mr. W. Frankish, Mr. James Hornsby, Mr. P. A. Muntz, M.P., Mr. A. E. Pease, M.P., Mr. S. Rowlandson, Mr. Howard P. Ryland, Mr. E. W. Stanyforth, Mr. Garrett Taylor, and Mr. C. W. Wilson.

The minutes of the last meeting of the Council, held on March 1, 1899, having been taken as read and approved,

Presidency for 1900.

The PRESIDENT said it would be in the recollection of the Council that at the last meeting he was asked to approach H.R.H. the Prince of Wales, K.G., with the request that he should act as President of the Society for the year 1900. He (Lord Coventry) was pleased to say that His Royal Highness had graciously consented to add to the many favours which he had shown to the Royal Agricultural Society by expressing his willingness to act in that capacity.

Election of New Members.

The election of forty-one new members was then proceeded with.

BAYNHAM, Edmund C...Linton, Dover.
BIRGE, Wm. B...115 Southwark Street, S.E.
BORNEMANN, August..Lincoln.
BOSWORTH, John..104 Newland, Lincoln.
BULTEEL, Thomas..Radford, Plymouth.
BURT, W. H...Phillips Farm, Eaton Hastings, Faringdon.
COLLEY, J. N. C. Davis, M.B...36 Harley St., W.
CULLWICK, John A...Lynn Lane, Lichfield.
DAVIES, Herbert E. M...Cavenham Park, Cavenham, Soham.
EMMOTT, Wm. R...Horton Hall, Chipping Sodbury, Glos.
EYKYN, James Ackleton..Wolverhampton.
FELL, Christopher..Allan Bank, Windermere.
FINLAY, Rev. W. R...All Saints Vicarage, Sumner Road, North Peckham, S.E.
FOSTER, William..Mel Valley, Moseley, Birmingham.
GELDART, Rev. J. W...The Rectory, Kirk Deighton, Wetherby.
GIBBONS, G...Clifford, Great Walstead, Lindfield, Sussex.
GODMAN, Joseph..Park Hatch, Godalming.
*GRIGG, E. F. J...Longbeach, Canterbury, New Zealand.
JEWELL, Charles..The Laurels, Eastbourne.
KING, James M...Gedney Villa, Wilbury Gardens, Hove, Brighton.
KIRBY, James..Victoria Road, Ashford, Kent.
LANGRIDGE, Wm...Rodmill, Eastbourne.
LOWE, Thos. P. T...Gosfield Hall, Halstead.
MICKLE, George..Kirklington, Bedale.
NEAME, C. Gordon..Copton Mnr., Faversham.
NEWTON, Thomas..Warren Farm, Mansfield Woodhouse, Notts.
NEWTON, Arthur H...Pury Park, Stony Stratford.
NISBET, Wm...Stratford St. Andrew, Saxmundham.
PARK, W. S...Hatton, Bishopton, Renfrewshire.
PETERS, Robert..7 Downing Street, Cambridge.
PRITCHARD, Wm...Tanyfron, Garthmyl, Mont.
SMITH, Arthur..Stretton Hall, Stretton, Warrington.
STAINTON, W. A...Hornsey Road, London, N.
STEINKOPFF, Edward..Lydhurst, Hayward's Heath.
VERNON, Guy..Auchans, Kilmarnock.
WIGAN, Lewis D...Hoscote, Hawick, N.B.
WIGAN, Mrs...Oakwood, Maidstone.
WILMOT, S. M...Albert Road, St. Phillips, Bristol.
WOOD, Leslie S...Temple End, High Wycombe.
WOODRUFF, Rev. Chas. E...Otterden Rectory, Faversham.
WOOLLEY, Fredk...Ellerton Grange, Newport, Salop.

The reports of the various standing Committees were then presented and adopted as below:—

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the period ended March 25, 1899, as certified by the Society's Accountants, showed total receipts amounting to 3,973*l.* 11*s.* 3*d.*, and expenditure amounting to 3,196*l.* 7*s.* 1*d.* Accounts amounting in all to 4,044*l.* 0*s.* 2*d.* had been passed, and were recommended for payment.

Journal.

Sir JOHN THOROLD (Chairman) reported that the first part of the Journal for 1899 was in the press, and the honoraria for various articles and notes had been passed for payment. The Committee recommended that the best thanks of the Society be sent to Mr. Pell for his article on the "Making of the Land in England." An application for an exchange of publications received from the Khedivial Agricultural Society had been acceded to. The contents of Part II. of the Journal (June) had been preliminarily discussed, and instructions given to the Editor thereon. A report by Mr. Walter Heape on "Barrenness in Ewes" had been accepted for publication in a future number of the Society's Journal. The Secretary had submitted specimens of lantern slides prepared from the illustrations of live stock in the Society's Text Book.

Chemical and Woburn.

Mr. WARREN reported that the annual valuation of the corn crops at Woburn had been made, the results showing a general agreement with those of 1897. The Committee had decided that in order to suit the convenience of members of Council who were on other morning committees, they would in future meet at 11 a.m., instead of 10.30 a.m. Sir John Thorold's tenure of office as one of the Society's representatives on the Lawes Agricultural Trust would expire shortly, and the Committee unanimously recommended that Sir John be reappointed for the ensuing five years.

A formal motion to this effect was proposed by Mr. Warren, seconded by Sir Nigel Kingscote, and agreed to.

The following report had been presented by Dr. Voelcker, and ordered to be published in the usual manner:—

Report of Consulting Chemist.

"NITRIFICATION" MANURE.—It was perhaps to be expected that the discoveries of agricultural science with reference to the important work of micro-organisms in the soil would be turned, rightly or wrongly, to

* Re-instated under Bye-Law 12.

some profitable use by the manufacturers and vendors of certain classes of artificial manures. For some of these preparations it is claimed that they possess in a special degree the power of rendering the land "fertile by nitrification."

Of this kind is a manure which has recently come under my notice. It is sent by the manufacturers, carriage paid, to any railway station at 3*l.* 10*s.* per ton. It is stated to be "much superior to bones, blood, or nitrate of soda," and to be "recommended for all crops as the best manure ever put on the market, irrespective of price."

After a further description of its qualities, included among which is that "its extensive use through a number of years has shown that one dressing in every two years on most lands never fails to produce perfect nitrification of the soil, and a continuation of sound heavy crops" comes the following statement:—"The Royal Agricultural Society of England and the Agricultural Societies of Scotland now speak of nitrification as the best and cheapest means of fertilisation." The guaranteed analysis is:—

Nitrogen, equal to ammonia	3·25 per cent. to 5 per cent.
Phosphate	4·00 per cent. to 7 per cent.
Potash	·20 per cent. to 1·50 per cent.

A sample sent to me by a member gave on analysis:—

Moisture	14·04
*Organic matter	49·11
Phosphate of lime	4·35
Carbonate of lime, oxide of iron, &c.	10·80
Sand	21·70
	100·00
* Containing nitrogen	3·16
Equal to ammonia	3·77

The material, it must in fairness be said, came up to the minimum guarantee, but my examination of it, in order to find wherein its special merits consisted, showed me that it was nothing more than a preparation of shoddy with a little bone material thrown in. Any advantages it possessed would equally belong to a mixture of shoddy with a little bone, which would cost only 2*l.* a ton or so.

"Soot" Mixture.—Soot, when genuine, is a good top-dressing for wheat, but the material, a sample of which a member sent me, and which was offered to him at 40*s.* per ton, was neither suitable for the purpose nor worth the money. The analysis was:—

Moisture	20·60
*Organic matter	25·47
Phosphate of lime	3·48
Oxide of iron, &c.	14·46
Silicious matter	35·99
	100·00
* Containing nitrogen	·83
Equal to ammonia	1·00

A good sample of soot should contain about 4 per cent. of ammonia; but a material like the above, with so little ammonia, is not suitable if used in ordinary quantities, for top-dressing wheat, and the worth of it is under 1*l.* a ton.

Nitrate of Soda.—I have, in my annual reports, frequently spoken of the freedom from impurity of the samples of nitrate of soda sent me by members. The following analysis, recently made, shows an exception which should make purchasers cautious:—

Water	4·73
Chloride of sodium (common salt)	4·22
Other impurities	1·13
Pure nitrate of soda	89·92
	100·00

This had been sold under a guarantee of containing "95 per cent. pure nitrate."

Hard-pressed Linseed Cake.—A sample of linseed cake, sent by a member, gave the following very low result in oil: Oil, 6·96 per cent. It was an extremely hard cake, and had also 1·79 per cent. of sand.

Mixed Linseed and Cotton Cake.—I have frequently had occasion to point out unsatisfactory features connected with the manufacture of compound or mixed feeding-cakes; not that there are not many excellent and honestly made mixed cakes to be had, the component parts of which are sound and good feeding materials. But this is not always the case, and purchasers need to exercise caution. In the following instance a member of the Society sent me a cake which he said he had bought as "an equal mixture of pure linseed and decorticated cotton cake." The price of this was 7*l.* 2*s.* 6*d.* per ton at Hull. On examination of it I certainly found that there was linseed cake in it, and also decorticated cotton cake, but a great deal else besides. The analysis was:—

Moisture	15·02
Oil	8·88
*Albuminous compounds	33·92
Mucilage, starch, &c.	28·09
Woody fibre	8·72
Mineral matter (ash)	5·37
	100·00
*Containing nitrogen	5·43

According to this, if the cake was made of pure linseed cake and decorticated cotton cake, these must have both been very poor in oil to have yielded only 8·88 per cent. in an equal mixture. But, in addition, I found a quantity of weed seeds and other admixture, included among which were spurry, earth-nut, rape, mustard, and starchy materials. The purchaser would have done much better to have bought the materials separately, and to have made his own mixture.

(Signed) J. Augustus Voelcker.

13 Hanover Square, W.,
March 28, 1899.

Botanical and Zoological.

Mr. Whitehead (Chairman) reported that the spring manures had been applied to the grass experiments; and that Dr. Voelcker was about to carry out some experiments at Woburn on the eradication of weeds. The subject of vegetable poisoning of live stock was under the special attention of the Committee.

The Consulting Botanist and the Zoologist had presented the subjoined reports:—

Report of Consulting Botanist.

During the past three months the Consulting Botanist has dealt with 57 applications from members of the Society. The majority of these (45) have related to the purity and germination of the seeds of grasses and clovers, nine were inquiries in regard to plants or seeds supposed to be injurious to stock, and three had reference to fungal diseases.

Some of the plants sent, which were supposed to be injurious, possess no objectionable properties.

The ground ivy (*Nepeta Glechoma*, Benth.) is a plant generally distributed over Britain. It is common in low-lying meadows in the Fen districts, where it is called "turn-leaf," and is there popularly believed to cause abortion if eaten by mares when in foal. This is a perennial weed, with a stem creeping on the surface of the ground, small, roundish leaves and blue purple flowers. The plant is bitter and aromatic. It was formerly used for clarifying and flavouring ale, and a tea prepared from its leaves, which possesses stimulant properties and an agreeable aromatic odour, is in repute in some districts among country people. Many virtues were formerly ascribed to the ground ivy, but it has no properties that would make it a dangerous plant to stock.

From North Lincolnshire specimens of *Ranunculus parviflorus*, Linn., were sent as a suspicious plant. No doubt this, like the other species of buttercup, is an undesirable weed in pastures. All these plants are more or less acrid, and are rejected by stock in the fields. The buttercup is a worthless, if not also a dangerous, weed, and should not be allowed to exist in any pasture. The acridity of the plant disappears in drying.

Lawson's cypress (*Cupressus Lawsoniana*), extensively grown as an ornamental shrub or tree, was sent as a probably dangerous plant. The cypresses are astringent, and were formerly used in medicine, but they are not poisonous like the yew. No record exists of their having caused any injury to stock.

Some calves were reported as having died, apparently, from poison. They had access to branches of rhododendron and laurel—both very poisonous plants. The Veterinary Surgeon believed death to be due to the rhododendron, and there appears good reason for believing that this was so. The species of this genus are narcotic, and persons injured by eating it are found to suffer from nausea, vomiting, drowsiness, and stupor, and ultimately they die. The laurel (*Laurus nobilis*, Linn.) and the cherry laurel (*Prunus laurocerasus*, Linn.) are both dangerous plants, especially the latter. Though occupying in systematic botany very distant places from each other, they both contain an essential oil rich in prussic acid. The symptoms of poisoning by plants containing prussic acid are laboured breathing, a weak pulse, suffocating convulsions ending in death. The effects of the poison have been overcome by the use of artificial respiration accompanied with the injection of atropine, which is an antidote to prussic acid. Care must be taken to prevent stock having access to either of these plants, and when the bushes are clipped, the cut branches should never be left where animals can get to them.

Specimens of an ornamental tobacco (*Nicotiana affinis*) were submitted as probably injurious to cattle. This is certainly a dangerous plant, like the other species of the genus. It is a powerful narcotic, causing vomiting, weak action of the heart, and loss of muscular power. Wherever this plant is grown in garden or shrubbery, care should be taken that it is so enclosed that animals may not have access to it.

A sample of seeds supplied for feeding poultry were examined, and found to consist of the following seeds:—

Corn bindweed (*Polygonum convolvulus*, Linn.) . .	48 per cent.
Broken or small seeds of wheat	44 per cent.
Corncockle (*Githago segetum*, Desf.) . . .	7 per cent.
Other seeds—linseed, cleavers, and charlock . .	1 per cent.

The seeds of corncockle are very dangerous to fowls, and the continued use of the mixture, containing so large a proportion as 7 per cent., would certainly be so injurious to poultry as to issue in death. The poisonous principle is found in all parts of the plant, but it is more concentrated in the seed. It specially affects poultry, but the use, for some time, of wheaten flour, which has been made from grains containing seeds of corncockle, has produced dangerous symptoms in men and quadrupeds. It causes nausea, vomiting, headache, diarrhœa, and death. Corncockle should be treated as a dangerous weed. It is an annual. Seed corn containing its seeds should not be sown.

A sample of oats purchased for feeding horses was examined, and found to contain a considerable amount of impurities, and among them seeds of a species of bitter vetch (*Lathyrus*), a plant most injurious to man and animals. The seeds contain a narcotic principle which produces paralysis of the limbs, and even death. The mixture was quite unfit for animal food.

A sample of crushed oats was submitted because of the presence of black husks which were suspected of being the cause of abortion in five Shire mares. The husks were the covering of the seeds of corn bindweed (*Polygonum convolvulus*, Linn.). This is an innocent plant, and its seeds had certainly nothing to do with the abortion of the mares.

Only a few cases of injury, due to the attacks of fungi, have been investigated. The larch canker has seriously injured the plantations in some districts of Westmorland. The attacked trees have been cut down when comparatively young and of little money value, and the cleared places have not been planted with other trees. It should be remembered that the fungus causing the canker is not known to attack other coniferous trees than the larch.

From Lincolnshire samples of ears of wheat were sent, which had given a poor yield. They were attacked by two parasitic fungi. The one, *Cladosporium herbarum*, Pers., attacks the chaff, seeds, and stems of the wheat, producing small, dark spots, formed by the erect stalks which bear the spores at the top or on the sides. The other,

Erysiphe graminis D. C., is a whity brown fungus, which has in certain years done much damage to the wheat crop. Both these fungi, by seizing hold of the food that is being transmitted to the seed, starve it, and so greatly decrease the weight and value of the crop.

From South Oxfordshire was sent a patch of grass matted together by a whitish growth. This was due to the presence of *Spumaria alba D. C.*, a low organism belonging to the group Mycetozoa. This group consists in their feeding stage of free protoplasm, which increases in size as it moves forward in search of food. This it encloses in its substance, and when it has appropriated what it requires it pushes out the refuse. In this stage it acts like an animal. But when the plasmodium (or naked protoplasm) has attained maturity it concentrates itself at certain points, and develops into sporangia, filled with minute spores. In this stage it acts like a vegetable. The *Spumaria alba D. C.* is not a parasite. In its plasmodium state it may be found on dead leaves, or more frequently on grass, collecting round the stem of the gra s, or spreading extensively over the neighbouring stems, and compacting them together. In this stage it is opaque white. When the sporangia are formed they are covered with a fragile white covering of minute crystals of lime. These sporangia unite and, supported on the grass stems, may extend over a space of the pasture a foot in diameter. When the spores are ripe the white covering is broken up and the mass appears to be black or a dark dull purple from the innumerable dark spores which are exposed, and which are gradually floated away on the wind. They find a place to lie dormant during the winter, and in due time to produce the amœba-like plasmodium which has been described. This strange plant-animal has no injurious properties, but its presence is not desirable in a pasture. It should be destroyed by fire on the spot where it is found. If it is carried away the spores will be scattered, and new centres for the development of the organisms multiplied.

(Signed) WM. CARRUTHERS.

March 28, 1899.

Report of Zoologist.

As might have been expected, on account of the cold weather, no widespread insect attacks have hitherto been reported, but several matters of interest have cropped up in the transaction of the ordinary business of the department.

Inquiries have been received with regard to "mustard dross" as an antidote to wireworm, and it is possible that its efficacy for this purpose may be thoroughly tested.

Advice has been asked through members of the Society with regard to certain foreign insect pests, one in South Africa, and another in Argentina, and information has been given as far as possible.

A lady-bird sent for identification from Leominster proved to be an exotic species, *Chilomenes lunata*, and on enquiry it seemed probable that it had been imported with grapes from the Cape. The sender is attempting to establish it in his conservatory —a perfectly safe experiment, as lady-birds are uniformly useful, since they feed upon the green fly tribe.

An attack on pine shoots by the larvæ of a Cecidomyian fly has also occupied the attention of the Zoologist.

(Signed) CECIL WARBURTON.

March 28, 1899.

Veterinary.

The Hon. CECIL T. PARKER (Chairman) reported that the revise of the Society's leaflet on epizootic abortion in cows, and the proof of a new leaflet on quarter evil had been submitted by Professor McFadyean, and, after amendment, had been approved for publication. It had also been decided to issue a Welsh edition of the Society's leaflet on Tuberculosis in Dairy Cows. Professor McFadyean had presented the following report:—

ANTHRAX.—During the first eleven weeks of this year the outbreaks reported number 106, and the animals attacked 200. The corresponding figures for last year were 130 and 211 respectively.

GLANDERS.—The number of outbreaks reported during the first eleven weeks of this year is 155, and the number of animals attacked 287. These figures show a slight decline as compared with 1898, but are almost identical with those for the corresponding period of 1897.

SWINE FEVER.—The outbreaks reported for the first eleven weeks of this year number 498, as against 482 in the same period of 1898.

PLEURO-PNEUMONIA AND RABIES.—No case of either of these diseases has been discovered during the current year. The last case of pleuro-pneumonia was discovered in January, 1898, and the last case of rabies in October, 1898.

Regulations for Cowsheds.

Mr. PARKER said that the Council would be glad to know that the recommendations made by the Society as to the model regulations issued by the Local Government Board had been largely adopted. First, with reference to cows turned out to graze regularly, the requirements had been modified, and the Board no longer insisted upon 800 cubic feet of air space. Secondly, in regard to the ventilation of cow-houses in towns, where the animals were only turned out occasionally, the suggested regulation as to air space would remain, and to this he did not think the Council would take exception. It was, indeed, a matter of congratulation that the objections raised by them had been so far met.

The Earl of DERBY said there was still one point which was not quite

clear, and as it was rather important, he thought the Council might direct the attention of the Local Government Board to it. In the circular letter covering the model regulations which had now been issued to district and county councils, the following phrase appeared :—

> If the Council have not already made regulations under the Order of 1885, the Board think that they should do so, and that any such regulations would with advantage be based on the model clauses. If the Council have already made regulations under the Order, the model clauses may usefully be considered in connection with any fresh regulations or amendment of the existing code which the Council may propose to make.

It was the fact that certain local councils had prescribed a uniform minimum of 800 feet of cubic air-space as necessary, and these regulations had in some degree been acted upon. Where they had not been acted upon, perhaps it would not be too much to hope that the Society might have the help of the Local Government Board in letting it be known that the provisions of these regulations should not, in all cases, be put in force. He desired that the further operation of these rules should be suspended, or rather negatived, where, according to the new model clauses, they did not apply, but where, notwithstanding, local councils had passed a rule which compelled this amount of cubic air-space to be provided. If the suggestion were to go with the weight of a representation from that Council, he thought the difficulty would be removed.

After some remarks from Sir JACOB WILSON and Mr. ASHWORTH, Sir NIGEL KINGSCOTE said he thought that a letter signed by the President calling attention to the point which had been raised would be useful, and he moved that this be done.

Mr. PARKER seconded the motion.

The PRESIDENT said he was sure the Council had listened with great interest to the point raised by Lord Derby, and he had no doubt that they would be disposed to vote for the proposal made by Sir Nigel Kingscote. The motion was then put and carried unanimously (see p. lvi), and the report of the Veterinary Committee was adopted.

On the motion of the Hon. CECIL PARKER, seconded by the Earl of DERBY, a hearty vote of thanks was accorded to the President of the Board of Agriculture for his courtesy in receiving a deputation from the Society, and for his active co-operation in assisting them to obtain the concessions which they sought.

Stock Prizes.

Mr. SANDAY (Chairman) reported that the Devon cow, "Duchess of Flitton 2nd" (No. 981) exhibited by Mr. William Trick in Class 96 at the Birmingham meeting, to which the second prize had been awarded, and the reserve number animal, "Quantock Cowslip 10th," exhibited by Mr. E. J. Stanley, M.P., had both failed to comply with the regulations as to calving, and had consequently been disqualified. The Committee, therefore, recommended the award of the second prize of 10*l.* to Mr. Alfred Skinner's "Fancy 21st of Pound" (No. 979).

Mr. SANDAY moved, pursuant to notice, that the sum of 5,000*l.* be placed at the disposal of Committee for providing prizes for live stock, poultry, produce, &c., at the York Meeting of 1900. This was seconded by Sir JACOB WILSON, and carried unanimously.

Judges' Selection.

Mr. SANDAY reported that the List of Judges settled by the Committee at their previous meeting had been completed, and would be published in the Society's Journal to be issued on the 31st instant. The Committee had made a selection, from the List of Judges, of Umpires to act in cases of necessity.

Implement.

Mr. SANDAY (in the unavoidable absence through ill-health of the Chairman) reported that the Allotment Committee had arranged the positions of the stands, for which entries had already been received in the Implement Department of the Maidstone Meeting.

Showyard Works.

Sir JACOB WILSON (Chairman) reported that about 6,000 feet of implement shedding had been erected at Maidstone and the machinery-in-motion stands commenced. Progress had also been made with the grand stand and horse boxes, and the erection of the pavilions was in a forward state. The Local Committee had practically completed the levelling of the showyard, and the works for water-supply were in a forward state. Other details connected with the showyard had been discussed and settled.

Selection.

Sir JOHN THOROLD announced the receipt of a letter written on behalf of Sir Archibald Macdonald, Bart., resigning his Trusteeship of the Society through failing health. Sir Archibald had been connected with the Society for fifty rears, and for the last forty-five years had been almost uninterruptedly a member of the Council. He was sure they would regret very much the reasons which had led to his retirement.

Sir NIGEL KINGSCOTE said he might perhaps be allowed to say one word in moving that Sir Archibald Macdonald's resignation be accepted with great regret. Sir Archibald had been a brother officer with him over fifty years ago, and even then he took a great interest in Agriculture. Although he had not of late years taken a very active part in the work of the Society, his interest was unabated, and up till quite recently he had been a regular attendant at the Council meetings.

The PRESIDENT, in putting the motion, said he was sure they were all very sorry to lose the services of such a respected colleague as Sir Archibald Macdonald, and were very grateful to him for the services he had rendered in the past.

Dairy.

Mr. DUGDALE (Chairman) presented the recommendations of the Committee relative to various details in connection with the dairy at the Maidstone meeting.

Retiring Members of Council.

The following list was prepared of the twenty-five members of Council who retire by rotation, but are eligible, under Bye-law 23 (*b*), for re-election at the anniversary meeting in May, showing the number of attendances at Council and Committee meetings of each of such members during the past two years:—

Attendances at Meetings of Council and Committees from April, 1897, to March 1899, inclusive	Council Meetings. Total number, 18	Committees: No. of Meetings	Committees: Attendances
ASHWORTH, ALFRED	9	95	31
ASSHETON, R. C. (elected March 1, 1899)	—	—	—
BARING, VISCOUNT (elected Feb. 1, 1899)	1	—	—
BOWEN-JONES, J.	16	93	54
CORNWALLIS, F. S. W., M.P.	16	55	44
CRUTCHLEY, PERCY	16	79	52
DARBY, ALFRED	14	55	40
DERBY, Earl of, K.G.	11	46	20
DUGDALE, J. MARSHALL	18	71	65
GORRINGE, HUGH	9	—	—
JERSEY, Earl of, G.C.M.G.	8	16	8
MAINWARING, C. S.	11	87	43
MARTIN, JOSEPH	11	55	35
MILLER, T. HORROCKS	13	39	27
PARKER, HON. CECIL T.	15	166	111
PEASE, A. E., M.P.	9	39	23
PELL, ALBERT	13	46	27
REYNARD, FREDERICK (elected July 28, 1897)	13	36	33
ROWLANDSON, SAMUEL	13	90	64
SMITH, ALFRED J.	16	55	46
STANYFORTH, E. WILFRID	16	111	80
TAYLOR, GARRETT	15	39	34
TERRY, JOS. P.	11	49	36
WILSON, C. W.	6	35	13
WILSON, Sir JACOB	17	102	60

Meeting of 1901.

The SECRETARY read a letter from the Town Clerk of Cardiff, renewing the invitation from that town to the Society to hold its country meeting of 1901 there, and stating that a very desirable site had been placed at their disposal. It was decided that the matter should be considered further at the next meeting of the Council.

The Council then adjoured until Wednesday, May 3, 1899, at noon.

WEDNESDAY, MAY 3, 1899.

EARL SPENCER, K.G. (TRUSTEE) IN THE CHAIR.

Present.

Trustees.—General Viscount Bridport, G.C.B., Earl Egerton of Tatton, Earl Spencer, K.G.

Vice-Presidents.—Mr. H. Chandos-Pole-Gell, the Earl of Feversham, the Right Hon. Sir Massey Lopes, Bart., Lord Moreton, the Earl of Ravensworth, Sir John Thorold, Bart., Mr. Charles Whitehead.

Other members of Council.—Mr. Alfred Ashworth, Mr. J. Bowen-Jones, Lord Brougham and Vaux, Mr. Victor C. W. Cavendish, M.P., Lord Arthur Cecil, Mr. F. S. W. Cornwallis, M.P., Mr. Percy Crutchley, Lieut.-Col. Curtis Hayward, Mr. A. E. W. Darby, the Earl of Derby, K.G., Mr. J. Marshall Dugdale, Mr. R. Neville Grenville, Mr. James Hornsby, Captain W. S. B. Levett, Mr. Henry D. Marshall, Mr. Joseph Martin, Mr. T. H. Miller, Mr. P. A. Muntz, M.P., Mr. A. E. Pease, M.P., Mr. Dan. Pidgeon, Mr. J. E. Ransome, Mr. Frederick Reynard, Mr. C. C. Rogers, Mr. G. H. Sanday, Mr. Alfred J. Smith, Mr. Henry Smith, Mr. E. W. Stanyforth, Mr. R. Stratton, Mr. Martin J. Sutton, Mr. J. P. Terry, Mr. R. A. Warren, Mr. E. V. V. Wheeler, Mr. C. W. Wilson, Sir Jacob Wilson.

Officers.—Sir Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. J. E. Compton-Bracebridge, Assistant Director; Mr. R. S. Burgess, Superintendent of the Showyard.

Professor Sir George Brown, C.B.; Professor McFadyean.

The Mayor of Maidstone and Mr. R. A. Hamilton Seymour, Secretary of the Maidstone Local Committee.

Apologies for non-attendance were received from the Marquis of Granby, the Hon. Cecil T. Parker, Sir Walter Gilbey, Bart., Col. Sir Nigel Kingscote, K.C.B., Mr. J. H. Arkwright, Mr. R. C. Assheton, Mr. George Blake, Mr. W. Frankish, Mr. C. S. Mainwaring, Mr. Albert Pell, Mr. S. Rowlandson, Mr. H. P. Ryland, and Mr. Garrett Taylor.

The SECRETARY said he regretted to have to report that he had received an intimation from the President (the Earl of Coventry) that he was too unwell to be able to be present that day. It was usual, under such circumstances, for the ex-President to take the chair. On the motion, therefore, of Sir JOHN THOROLD, seconded by Mr. WHITEHEAD, Earl Spencer took the chair.

Election of New Members.

The minutes of the last meeting of the Council, held on March 29, 1899, having been approved, the election of the following forty-four new members was then proceeded with:—

ALDER, Gilbert, jun...The Springs, Wormley, Herts.
ARGLES, Cecil G...Adlingfleet, Goole.
ARNOLD, Edwin R...Ravenscourt, Holly Park, Crouch Hill, N.
BAMBER, H. Kelway..83 Westmore Road, Bromley, Kent.
BARCLAY, Hubert F...Epping House, Hertford.
BEAUMONT, Charles..East Bridgford, Nottingham.
BOSLEY, John..Lyde, Hereford.
BURBIDGE, Richard..21 Hans Mansions, S.W.
CHAFER, W. T...24 Christchurch Road, Doncaster.
CLARKE, John W. W...Gateford Villa, Worksop.
DUNCANSON, James..Langley Park Farm, Maidstone.
FALMOUTH, Viscount..Mereworth Castle, Maidstone.
FILMER, Sir Robert M., Bart...East Sutton Park, Maidstone.
FLETCHER, Richard S...The Beeches, Grimsby.
FRICKER, Julius A...Burton, Mere, Wilts.
GILLETT, John..West Flexford Farm, Wanborough, Guildford.
GRIFFITH, Captain J. H. S...Kintore, Maidstone.
HAMPTON, Wm. P...Langdon Abbey, Dover.
HEATHERLEY, Albert..Westminster Chambers, 7 Victoria Street, S.W.

HEPBURN, Mrs... The Hooke, Chailey, Lewes.
HINCKES, Ralph T... Foxley, Hereford.
HIPPISLEY, R. J. Bayntun.. Ston Easton Park, Bath.
HODGSON, George F... Matfen, Corbridge-on-Tyne.
JACKSON, A. J... Sunnyside, Hawkhurst, Kent.
LETHBRIDGE, Ambrose Y... Guards' Club, Pall Mall, S.W.
LUSCOMBE, John H... Hayheath, Worth, Sussex.
MORITZ, Dr. Edward R... 72 Chancery Lane, W.C.
MOUNSEY, Oswald R... Brook Cottage, Walmer, Kent.
MUNCKTON, Tom.. Estate Office, Old Warden, Biggleswade.
PILLERS, Mrs... The Lodge, Stud Farm, Keynsham, Bristol.
PULLIN, Wm... Parsonage Farm, Warminster.
ROBINSON, G. H... Amerton Farm, Chartley, Staffs.
ROGERS, Robert H... Marl House, Bexley, Kent.
ROGERSON, E. C... Park Cottage, Hunton, Maidstone.
ST. GEORGE, Captain B. J... Pensax Court, Stockton, near Worcester.
SLATER, Andrew.. Osborne, East Cowes, Isle of Wight.
SMITH, W. Lawrence.. 31 Portman Square, W.
STUDDY, Thomas E... Upper Bordean, Petersfield.
THWAITES, Thos... Stricklandgate, Kendal.
TICKLE, Ralph.. Hill Side Farm, Appleton, Warrington.
WALKER, C. Forestier.. Castleton, nr. Cardiff.
WELLS, Matthew H... Deansgate, Manchester
WEST, Lionel Sackville.. Knole, Sevenoaks.
WRIGHT, Whitaker.. Lea Park, Godalming.

The reports of the various Standing Committees were then presented and adopted as below:—

Finance.

Mr. ASHWORTH reported that the accounts for the period ended April 29 showed total receipts amounting to 2,352*l.* 18*s.* 9*d.*, and expenditure amounting to 4,017*l.* 5*s.* 1*d.* Accounts amounting in all to 2,286*l.* 13*s.* 2*d.* had been passed, and were recommended for payment. The quarterly statement of subscriptions, arrears, and property, as at March 25, 1899, had been laid upon the table. The Committee recommended that Mr. J. Marshall Dugdale be asked to undertake the duties of second Steward of Finance for the Maidstone Meeting in consequence of the continued indisposition of Mr. Rowlandson. The Secretary had reported the publication of a new list of Governors and Members corrected to December 31, 1898.

Journal.

Sir JOHN THOROLD (Chairman) reported the recommendation of the Committee that the article in the current number of the Journal, by Mr. W. J. Malden, on "Hedges and Hedge Making," be reprinted in pamphlet form at the price of 6*d.* per copy. With reference to a proposal that the Society should offer prizes for barley threshing machines, the Committee had resolved:—"That it is very desirable, if possible, to improve the process of barley threshing, so as to prevent the breakage of the grain, and the Journal Committee hope that the Implement Committee will see their way to taking some steps for bringing about such an improvement." The Editor had submitted the draft of the contents of the next number of the Journal, and various suggestions for articles and notes had been considered.

Chemical and Woburn.

Mr. STANYFORTH (Chairman) reported that the date of the annual visit of the Committee to the Woburn Experimental Farm had been fixed for Thursday, June 1 next. If any members of the Council desired to accompany the Committee he would be glad if they would kindly communicate with the Secretary, in order that the necessary arrangements might be made. Dr. Voelcker had presented the following report:—

Report of Consulting Chemist.

MIXED GRAIN, &c., SOLD AS "SHARPS."—The risk run in buying "odd lots" to oblige vendors who happen to have these lying at railway stations is exemplified by the following case:—

A member of the Society sent me early in March for examination a sample of what he had purchased as "sharps" from a respectable firm, who told him that they had 9 sacks (18 cwt.) of sharps at the station, and could he oblige them by taking these? They added, "They are a good feed, and we can charge you 5*l.* 15*s.* per ton for same." The member consented, having done business with the firm before. Without looking at the delivery he gave the material to his young pigs, and they were upset by it, and, as he described it, "nearly killed."

After examining the sample I reported, "This is not sharps at all, and ought not to be sold as such. It is just a mixture of several different kinds of grain, much of it of a refuse character. There is a quantity of sand, the percentage being 2·94. I find present maize in large amount, also barley, wheat (grain, not bran), oats, rice, with

different weed seeds, polygonum being the most prominent."

The vendors expressed their surprise at the result, and explained that they had bought the sharps as they lay at the station, believing them to be all right. In the end the purchaser wrote: "I have settled the matter for 2*l.* 10*s.*"

(Signed) J. AUGUSTUS VOELCKER.
13 Hanover Square, W.,
April 26, 1899.

A report by Professor McFadyean upon the results of a tuberculin test recently made upon certain of the cattle at Woburn was, after discussion, referred to the Veterinary Committee for consideration.

Botanical and Zoological.

Mr. WHITEHEAD (Chairman) reported that preliminary experiments on the extermination of weeds had been commenced by Dr. Voelcker at the Woburn Experimental Farm, and that Dr. Voelcker had been authorised to carry out any other such preliminary experiments as he might think desirable. The following reports had been received from the Consulting Botanist and the Zoologist:—

Report of the Consulting Botanist for April, 1899.

Sixty-three inquiries have been attended to on behalf of members of the Society. Of these fifty-four dealt with the purity and germination of seeds, seventeen being grasses and thirty-seven clovers.

A weed growing in patches in light meadow land in Yorkshire was determined to be *Polygonum bistorta* Linn., Snake Root or Patience Dock. It is not an injurious plant, but it forms a matted layer of twisted, creeping, underground stems some 2 to 4 inches below the surface, which prevents all other vegetation occupying the soil. It can be got rid of only by digging or ploughing up and carefully working the ground to remove every fragment of the fleshy stem. A specimen of *Luzula campestris* Willd., commonly called Blackcaps or Sweeps, was reported on. This wood rush had taken the place of the grass in a pasture in Warwickshire, said to have been killed by poisonous fumes from brick and tile works. It is a common weed in damp meadows, but has no injurious properties; it is rejected by all stock.

A case of club root in swedes caused by *Plasmodiophora* was investigated from Hampshire. The field was known to have had club root, consequently in preparing the soil—a light, sandy soil—for the crop, a good dressing of lime, ploughed in hot, was put on in the spring before the swedes were sown. Nevertheless the living protoplasm from the spores had obtained access to some of the turnips, and had produced, though in a modified form, the deformities of club root. The fungus was, however, in a feeble and exhausted condition, and had not, in the specimen submitted to me, been able to form spores. The action of the lime, though it had not completely destroyed the parasite, had greatly enfeebled the individuals that succeeded in escaping destruction.

Potatoes grown in a frame were sent from South Hampshire, suffering from some malady which had suddenly made its appearance. The leaves were covered with small green excrescences, and in some places were perforated. There was no fungus present, but the injury was caused by the excess of moisture present in the plant, which was not able to escape through the stomates as the surrounding atmosphere was so charged with moisture. This superabundant moisture causes the cells to swell and burst through the skin. The turgid cells separated from each other, and, losing their living connection with the leaf, began to decay. To prevent such an injury it is necessary to secure a somewhat drier atmosphere in the frame.

(Signed) WILLIAM CARRUTHERS.
May 2, 1899.

Zoologist's Report.

Among the commoner spring pests which have been brought to the notice of the Zoologist, the most serious attacks have been due to crane-fly and wheat-bulb fly, both of which have done considerable harm to wheat crops. Crane-fly grubs were sent from Devon for identification, with the observation that they were hitherto unknown in that part of the country. The wheat-bulb fly was chiefly injurious in the Fen districts.

An attack of the wood-leopard moth (*Zeuzera aesculi*) on apple trees has been reported from Wiltshire. It is somewhat rarely that this insect does serious harm, as it is far less common than the goat-moth, which it greatly resembles in its habits.

Tomatoes in Scilly have been suffering greatly from the attacks of "surface caterpillars"—the larvæ of certain Noctua moths. I find no previous record of such attacks in this country, though in America tomatoes are subject to depredations from similar grubs, which are there known as "climbing cut-worms." The best method of treatment for such attacks, where practicable, is by poisoned baits, which attract the grubs from the crop and kill them. In the United States the remarkable discovery has been made that bran, moistened and poisoned with Paris Green, is more attractive to such grubs than their food plant, and many acres of infested land have been cleared by its use.

A very interesting foliage pest from the Argentine has been sent to the Zoologist for identification and advice. It was ascertained to be *Oiketicus Kirbyi*, one of the case-bearing caterpillars of the family Psychidae, and some suggestions were made with regard to its treatment.

(Signed) CECIL WARBURTON.
May 2, 1899.

Mr. WHITEHEAD, in presenting the report of this Committee, thought it might be well to say that Dr. Voelcker had had under his observa-

tion certain experiments lately carried out at Chelmsford, with the view of exterminating charlock by the employment of a spraying solution of sulphate of copper, or of sulphate of iron. A 2 per cent. solution of sulphate of copper, or a solution of sulphate of iron of somewhat greater strength, had been found to be effectual in destroying charlock, without injuring the corn crop.

Veterinary.

The Earl of DERBY reported that there was still a considerable demand for the Society's leaflet on Tuberculosis, and the Committee recommended that in accordance with the request of the Bedfordshire County Council 1,500 copies of the leaflet should be forwarded to that body to be distributed to farmers and others in that county. A Welsh translation of this leaflet had been kindly prepared by Professor Anwyl, Professor of Welsh at Aberystwyth. This had been ordered to be printed forthwith, and it was recommended that the cordial thanks of the Society be sent to Professor Anwyl for the trouble he had taken in the matter.

An important letter from the Highland and Agricultural Society suggesting conjoint action by the two national agricultural societies with a view to considering what steps can be taken to eliminate tuberculosis from the herds of this country had been received on May 1, and the Committee proposed to consider it at their next meeting, with a memorandum thereon which they had requested the veterinary experts on the Committee to prepare.

Some difficulties having arisen as to the exhibition of pigs at Maidstone, in view of the onerous restrictions under which alone a licence could, under ordinary circumstances, be obtained from the local authority, the Committee had asked the President of the Board of Agriculture to receive a deputation to urge upon him the granting of a licence by the Board itself, under Article 11 of the Swine Fever (Movement) Order of 1898. Accordingly a deputation—consisting of the Earl of Derby, Lord Moreton, Mr. Ashworth, Mr. Cornwallis, Mr. Crutchley, Mr. Ryland, Mr. Sanday, and the Secretary—had waited on the previous day upon Mr. Long, who, after hearing the Committee's views, promised to grant a licence under Article 11, subject to the Society undertaking to carry out satisfactory measures as to the cleansing and disinfection of the area occupied by the pig pens: which the deputation readily promised should be done.

The Earl of DERBY said that he was sure the Council would wish to record their sense of the courtesy of the President of the Board of Agriculture in receiving the deputation, and of the readiness and promptitude with which he had complied with their request by promising to grant a special licence for the holding of an exhibition of pigs at Maidstone. He therefore moved, Mr. CRUTCHLEY seconded, and it was unanimously resolved, that a letter to this effect be written to Mr. Long.

The following report from Professor McFadyean was presented by the Committee:—

ANTHRAX.—During the first sixteen weeks of this year 169 outbreaks of this disease, with 330 animals attacked, were notified, the figures for the corresponding period of 1898 being 198 and 322 respectively.

GLANDERS.—The outbreaks reported for the first sixteen weeks of this year number 220, and the animals attacked 403, as against 239 outbreaks, with 449 animals attacked during the first sixteen weeks of 1898.

SWINE FEVER.—The number of outbreaks reported during the first sixteen weeks of this year are seven in excess of those for the same period of 1898, the figures being 771 and 764 respectively.

MISCELLANEOUS.—The number of morbid specimens sent to the Royal Veterinary College for examination during the month of April was 28. These included cases of tuberculosis, actinomycosis, tetanus (in lambs), anthrax, diseases due to worm parasites, tumours, &c.

Cubic Air Space in Cowsheds.

The Earl of DERBY said it would be in the recollection of the Council that at their last meeting it was decided at his instance to ask their President to write a letter to the Local Government Board urging further action with regard to the recent issue by the Board of Model Regulations as to cowsheds. Lord Coventry had accordingly addressed to the Board the following letter:—

Royal Agricultural Society of England,
13 Hanover Square,
London, W.

April 5, 1899.

SIR,—I am desired by the Council of the Royal Agricultural Society to express to you the Society's thanks for the consideration which you have been good enough to give to the representations made to you by the Society as to dairies and cow-sheds, and for the Model Regulations which the Local Government Board have now issued to District Councils on the subject.

It is highly satisfactory to the Council that a differentiation has now been made by the Board between the requirements as to cubic air-space in cow-sheds in towns and cow-sheds in the country. But, as the Board will be aware, there are considerable areas included in urban districts which are to all intents and purposes in the country, and the cow-sheds in which are occupied by cows that "are habitually grazed on grass land during the greater part of the year, and when not so grazed are habitually turned out during a portion of each day."

In many such districts regulations now exist which impose restrictions, as to a minimum cubic air-space per cow, which in the case of rural cow-sheds included in the area of such district are unnecessary and unduly restrictive. The Council note from the Board's circular of March 11 that local authorities are invited to consider the new Model clauses "in connection with any fresh regulations or amendment of the existing code which the District Council may propose to make." But the Society is apprehensive that unless some further action is taken by your Board, considerable hardship may be caused to farmers living in districts technically urban, where regulations now exist imposing upon every cow-shed, wherever situated, the necessity of a uniform minimum cubic air-space per cow.

The Council of this Society desire me, therefore, to suggest that it should be made clear to local authorities, by means of a further circular, or otherwise, as your Board may deem proper, that in the opinion of the Board the power which local authorities possess of making regulations as to dairies, cow-sheds, and milk-shops, under Article 13 of the Order of 1885, should be regarded as subject to the limitations contained in the Board's circular of March 11, 1899; and that if regulations are now in force in any district which conflict with the interpretation of the powers of local authorities as laid down in the recent circular, the District Council should be invited to bring its local regulations into harmony with the Model Regulations of your Board.

I am, &c.,
(Signed) COVENTRY, *President.*

The Right Hon. the President of the Local Government Board.

To this communication the following reply had now been received:—

Local Government Board,
Whitehall, S.W.
April 28, 1899.

MY LORD,—I am directed by the Local Government Board to advert to your letter of the 5th instant, with reference to the operation of regulations now in force in urban districts under Article 13 of the Dairies, Cow-sheds and Milk-shops Order of 1885.

The Board have given consideration to the suggestion made by the Council of the Royal Agricultural Society, that in view of the Model Regulations, issued by the Board a further circular should be issued to secure the making of fresh regulations in cases where the regulations in force may differ from the Model series; but they cannot undertake to issue such a circular.

The Board pointed out in their circular letter of the 11th ultimo that "If the Council have already made regulations under the Order, the Model clauses may usefully be considered in connection with any fresh regulations or amendment of the existing code which the Council may propose to make" (see p. 2, para. 4). If the existing regulations in any particular district were felt to be onerous, it would be open to the dairy farmers to approach the local authority on the subject, with a view to their considering the question of modifying the regulations on the lines of the Board's Model code.

I am, &c.,
(Signed) H. C. MONRO,
Assistant Secretary.

The Right Honourable
the Earl of Coventry,
President of the
Royal Agricultural Society of England.

Having considered the letter of the Local Government Board, the Veterinary Committee were of opinion that no useful purpose would be served by again addressing the Board on the subject; but with reference to the last paragraph of the letter of April 28 they thought the attention of landlords, dairy farmers, and others might well be directed to Section 14 of the Order in Council of June 15, 1885, under which:—

> If at any time the Local Government Board are satisfied on inquiry, with respect to any regulation, that the same is of too restrictive a character, or otherwise objectionable, and direct the revocation thereof, the same shall not come into operation, or shall thereupon cease to operate, as the case may be.

If, therefore, in any particular case the owner or occupier of a rural cow-shed considered the existing regulations of the local authority were too restrictive in character in their application to his own cowshed, it appeared to be open to him to appeal to the Local Government Board for an inquiry, with a view to the revocation of such bye-law or the exemption of his cow-shed from its operation.

Stock Prizes.

Mr. SANDAY (Chairman) reported that the Committee had considered an application respecting the eligibility of a pure-bred ram from the Argentine Republic for entry at the Maidstone Meeting. The Committee were of opinion that there would be no objection to its exhibition at the Society's Country Meeting, provided the animal could be brought into this country and that the regulations of the Society's prize-sheet were complied with. A letter was also read suggesting that the Council should take action with a view to arranging for the exhibition at the Society's Meeting of a number of colonial-bred specimens of British breeds of sheep. The Committee, however, could not recommend the Society to take any steps towards the removal or modification of the restrictions in force in connection with the importation of colonial-bred animals to this country. Various letters had been read respecting entries made for the Maidstone Meeting, and instructions had been given for replies thereto.

Judges Selection.

Mr. SANDAY (Chairman) reported that the judges of Hampshire Down Sheep at Maidstone would be Messrs. J. Carpenter, Manor House, Burcombe, Salisbury, and T. A. Edney-Hayter, The Mount, Whitchurch, Hants. In view of the large number of entries of cider and perry, the Committee recommended the appointment of Mr. H. Symons, of Totnes, as a second judge for Classes 328 to 331.

Implement.

Mr. SANDAY reported that the Committee had discussed and settled various points connected with the trial of implements at Maidstone. They had gone very fully into the question of a proposal to hold trials of machinery specially adapted for threshing barley, but had postponed further consideration of the matter until the next meeting of the Committee (see p. lxvi). The Committee had also decided to recommend to the Council that, without instituting a comparison between steam cultivation operated by rope traction, the Society should offer prizes of 40*l.* and 20*l.*, in connection with the York Meeting, for the best Steam Diggers.

Barley Threshing.

Mr. RANSOME thought it would be somewhat of a slur upon the manufacturers of steam threshing machines throughout the country if it were allowed to go forth that the implement makers were unable to turn out machines which were capable of threshing barley as perfectly as it was possible for it to be threshed. Everything did not, of course, depend upon the machine; it was necessary that the condition in which the barley was harvested should also be taken into account. If it were very dry and brittle, it was next to impossible to touch it, even with the human hand, without splitting some small portion of the skin. It was a mistake to suppose that the breaking of the barley took place only in the drum. It was done in other parts of the machine—in the awner as well as in the drum. It was well known that a new machine direct from the makers was not so satisfactory as one that had been in use for a short time. On the other hand, after a machine had been in use for two or three years, and had become much worn, it was necessary to adjust it so as not to damage the corn. He believed that any prize offered simply for a drum, as had been suggested, would be an incomplete test.

Mr. MARSHALL said he thought it was more a question of management. Any properly constructed machine, if it were carefully and skilfully manipulated, would thresh barley satisfactorily.

Sir JOHN THOROLD said that all the Journal Committee desired to suggest was that, if possible, the question might be considered and something done to improve matters.

Trials of Steam Diggers.

Sir JACOB WILSON asked whether, in the contemplated trials of steam diggers, it was intended that a

distinction should be made between steam diggers and those drawn by rope? Did he understand rightly that the latter were to be excluded?

Mr. SANDAY said he should say they were.

Sir JACOB WILSON begged then to draw the attention of the Council to the importance of the step which they were asked to take. Remembering that up to the present the majority of diggers had been drawn by rope traction, it would cause some bewilderment in the public mind if they were to give a prize to one which was not drawn by rope traction. In his opinion the trials should not be initiated unless all kinds of diggers were represented.

Mr. BOWEN-JONES said that experts upon this matter had stated that there was no such thing as a digger drawn by rope traction. What Sir Jacob referred to was a cultivator, and there was no comparison between a steam cultivator and a steam digger. The latter was a process which many people believed would be of great advantage to Agriculture if used more extensively, and he thought the Society should do all it could to encourage it.

After some further remarks by Sir JACOB WILSON, Mr. NEVILLE GRENVILLE, Mr. MUNTZ, and Mr. MARTIN,

Mr. MARSHALL said that the difference between the results obtained by steam ploughs and cultivators was now a known quantity. It had been before the agricultural community for a number of years. There were several manufacturers who had spent a considerable sum of money in developing the digger industry, and he thought that at any rate their work should be put before the public by that Society, so that an authoritative opinion might be obtained as to how far these machines were adapted to the requirements of modern husbandry.

The CHAIRMAN said that as no amendment was before the Council, he should proceed to put the original motion, which was that the Report of the Implement Committee be received and adopted. This was carried unanimously.

General Maidstone.

Mr. CORNWALLIS, M.P., reported that the Committee had had an interview with the officials of the railway companies concerned, and had received assurances that the accommodation—both for passengers, stock, and goods—would be adequate, arrangements having been made for a large number of extra and special, as well as excursion trains. An intimation had been received that H.R.H. the Prince of Wales, K.G., the President-Elect, had promised to pay a visit to the Show on Tuesday, June 20.

Showyard Works.

Sir JACOB WILSON reported that the implement shedding at Maidstone was nearly completed. The shedding for cattle and horses, as well as the erection of the pavilions, was in a forward state, and the contractors for refreshments had erected a part of their premises. The water mains had been laid, and the service pipes were now in hand. The Local Committee were laying the sleeper roads in front of the entrances, and had filled one of the water tanks for testing purposes.

Committee of Selection.

The recommendations of this Committee having been read—that Sir John Thorold should be suggested to the General Meeting on the 29th instant for appointment to the vacant Trusteeship of the Society, and that Sir Jacob Wilson should be nominated for the vacancy thus created in the list of Vice-Presidents,

Lord BRIDPORT, as the senior Trustee present, begged to nominate Sir John Thorold as a Trustee of the Society, to fill the vacancy caused by the retirement of Sir Archibald Macdonald. His Lordship said that everyone present would desire to take that opportunity of showing their appreciation of Sir John's valuable services to the Society.

Earl EGERTON of TATTON seconded the nomination, which was carried unanimously; and Sir JOHN THOROLD returned thanks to the Council for the honour conferred upon him.

Sir JOHN THOROLD proposed, and the Earl of FEVERSHAM seconded,

the election of Sir Jacob Wilson as a Vice-President of the Society, to fill the vacancy caused by the election of Sir John Thorold as Trustee. The motion was unanimously agreed to, and Sir JACOB WILSON expressed his grateful thanks for the compliment which his colleagues had paid him.

Education.

Lord MORETON (Chairman) reported that forty-four entries had been received for the Society's examination in the Science and Practice of Agriculture, the time table for which had been fixed as follows:—

Tuesday, May 9:—
Agricultural Engineering 10 a.m. to 1 p.m.
Book-keeping . . . 2 p.m. to 5 p.m.
(Agricultural Engineering, *vivâ voce*, throughout the day.)

Wednesday, May 10:—
Agriculture (Part I.) . 10 a.m. to 1 p.m.
Agriculture (Part II.) . 2 p.m. to 5 p.m.
(Agriculture, *vivâ voce*, throughout the day.)

Thursday, May 11:—
Chemistry (General) . 10 a.m. to 1 p.m.
Chemistry (Agricultural) 2 p.m. to 5 p.m.
(Chemistry, *vivâ voce*, throughout the day.)

Friday, May 12:—
Land Surveying . . 10 a.m. to 1 p.m.
Geology . . . . 2 p.m. to 5 p.m.
(Land Surveying and Geology, *vivâ voce*, throughout the day.)

Saturday, May 13:—
Veterinary Science . . 10 a.m. to 12 noon.
Agricultural Entomology 12 noon to 1.30 p.m.
Botany . . . 2.30 p.m. to 4.30 p.m.
(Veterinary Science, *vivâ voce*, throughout the day.)

The examination would be held at the Examination Hall of the Royal College of Physicians and the Royal College of Surgeons on the Victoria Embankment, and it had been decided that only a proportion of the questions on each paper should be answered by the candidates.

Dairy.

Mr. DUGDALE (Chairman) reported that various matters connected with the Society's forthcoming meeting at Maidstone had been discussed, and instructions given thereon.

Retiring Members of Council.

The SECRETARY submitted, in compliance with bye-law 23 (*c*), the list of the twenty-five members of Council retiring by rotation, but eligible for re-election at the General Meeting to be held on Monday, the 29th instant (see p. li).

Miscellaneous.

The Report of the Council to the Anniversary General Meeting, to be held on May 29, at 13 Hanover Square, W., having been prepared, and other business transacted, the Council adjourned until Wednesday, May 31, at 10.30 a.m.

WEDNESDAY, MAY 31, 1899.

THE EARL OF COVENTRY (PRESIDENT) IN THE CHAIR.

Present.

Trustees.—General Viscount Bridport, G.C.B., Sir Walter Gilbey, Bart., Colonel Sir Nigel Kingscote, K.C.B., the Duke of Richmond and Gordon, K.G., Earl Spencer, K.G., Sir John Thorold, Bart.

Vice Presidents.—Mr. H. Chandos-Pole-Gell, the Earl of Feversham, the Right Hon. Sir Massey Lopes, Bart., Lord Moreton, the Earl of Ravensworth.

Other Members of Council.—Mr. J. H. Arkwright, Mr. Alfred Ashworth, Mr. R. C. Assheton, Viscount Baring, Mr. J. Bowen-Jones, Lord Brougham and Vaux, Lord Arthur Cecil, Mr. F. S. W. Cornwallis, M.P., Mr. Percy Crutchley, Lieut.-Col. Curtis-Hayward, Mr A. E. W. Darby, Mr. J. Marshall Dugdale, Mr. W. Frankish, Mr. Hugh Gorringe, Mr. James Hornsby, the Earl of Jersey, G.C.M.G., Mr. C. S. Mainwaring, Mr. T. H. Miller, Mr. P. A. Muntz, M.P., the Hon. Cecil T. Parker, Mr. A. E. Pease, M.P., Mr. J. E. Ransome, Mr. Frederick Reynard, Mr. C. C. Rogers, Mr. G. H. Sanday, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. J. P. Terry, Mr. R. A. Warren, Mr. E. V. V. Wheeler.

Officers.—Sir Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. J. E. Compton-Bracebridge, Assistant Director; Mr. R. S. Burgess, Superintendent of the Showyard.

Professor McFadyean.

The Mayor of Maidstone, Sir Marcus Samuel, and Mr. R. A. Hamilton Seymour, Secretary of the Maidstone Local Committee.

Apologies for non-attendance were received from Mr. Victor C. W. Cavendish, M.P., Mr. S. Rowlandson, Mr. H. P. Ryland, Mr. Henry Smith, Mr. E. W. Stanyforth, Mr. Charles Whitehead, and Sir Jacob Wilson.

Election of New Members.

The minutes of the last monthly meeting of the Council, held on May 3 last, having been approved, the election of the following fifty members was proceeded with:—

*ABRAM, Lawrence..Durham College of Science, Newcastle-on-Tyne.
ADAMS, W...Wotton Underwood, Aylesbury.
AMIES, E...8 Ashford Road, Maidstone.
ANDREWS, J. W...Beresford Rd., New Brompton.
ATHORPE, G. M...Morthen Hall, Rotherham.
BODDINGTON, H. W...Silverdale, Carnforth.
BOOTH, R...Warlaby, Northallerton.
BRASSEY, Hon. T. A...Park Gate, Battle.
BROWN, G. W. F...Roborough, Pilton, Barnstaple.
CHAPMAN, W. W. T...27 Irwell Chambers, Liverpool.
COLLINS, L. G. A...Leopold House, Reading.
DAVIDSON, A. P...White's Club, S.W.
*DELLSCHAFT, A. H...S.-E. Agri. Coll., Wye.
FORESTER, Lord..Willey Park, Broseley.
GORBUTT, W...Epworth, Doncaster.
GORE, Capt. A. J...Hook Hall, Uckfield.
GRAHAM, G...Primrose Hill, Tonbridge.
GREEN, W. J...Childerley Gate, Cambridge.
HANNATH, J. W...Coleby Hall, Doncaster.
HARRIS, W...Cottesmore, Oakham.
HARWOOD, E...Woodhouse, Almondsbury, Bristol.
*HINCHCLIFF, J. H...Yorkshire College, Leeds.
JONES, J. M...Mathrafal, Meifod, Mont.
JONES, W. B...Cefn, Bryntalch, Abermule.
LECKE, J...Newland Court, Malvern.
LEEKE, W. H...Braces Leigh, Malvern.
LE GRICE, C. H...Fawley Manor, Wantage.
LE MAY, E...Denmark House, Tonbridge.
LEPHARD, E...Manor House, Worthing.
MILLS, Hon. E...17 Stratton Street, W.
MINSHULL, J., jun...Mollington, Chester.
NEVILLE, N. J. C.—Little Woodcote, Kenilworth.
NEWTON, T...Agri. and Horti. School, Holmes Chapel.
NOBLE, Walter..Braziers' Hall, Creeting St. Peters', Needham Market.
PARDY, Alexander..Pietermaritzburg.
PRYCE-JONES, W. E...Dolerw, Newtown, Mont.
REEVES, F., jun...Yalding, Maidstone.
ROTHSCHILD, Miss A. de..Waddesdon Manor, Aylesbury.
SHAVE, H. O...Royal Star Hotel, Maidstone.
SHIPLEY, John..Melwood Grange, Epworth.
*SIMPSON, S...Wiswell, Whalley, Blackburn.
SMITH, F., jun...Loddington, Maidstone.
STUBINGTON, Major Frank..Oaklands, Havant.
THACKERAY, R...New Hall Farm, Dovercourt.
THORNTON, R. T...Middleton Hall, Brentwood.
THURLOW, G. R...Stowmarket.
THURLOW, J. T...Stowmarket.
TRAFFORD, E. S...Wroxham Hall, Norfolk.

* Life Member by Examination.

WEBB, C...Brettenham Manor, Thetford.
WILKINSON, R. T...Sunnyside, Gargrave, Yorks.

Country Meeting of 1901.

Sir JOHN THOROLD (Chairman of the Committee of Selection) said it would be in the recollection of the Council that the Committee had had before them on more than one previous occasion an invitation to the Society from the Corporation of Cardiff to pay a visit to that town; and at the Council's request the Honorary Director (Mr. Crutchley) had inspected, on April 12, the site originally offered on Lord Bute's property, to the north of the Sophia Gardens, and bordered on the right by the River Taff. This site was, in many respects, unsatisfactory, and a large part of it was arable land. But since the last meeting of the Council an intimation had been received that a more eligible site would be available in the Llandaff Fields of nearly 70 acres, recently purchased by the Corporation, and adjoining the site originally proposed.

The Honorary Director and Mr. Sanday (Chairman of the Stock Prizes Committee) had made an inspection of the Llandaff Fields on May 15, and had presented a report stating that by selecting a portion (some 40 acres) of this property, and a portion (some 50 acres) of Lord Bute's property, a suitable site for a show-yard might be obtained, and one much superior to that first offered. Most of the site proposed would be old pasture. Some of the fields were intersected by hedgerows, which would have to be grubbed up; a good deal of levelling would also be necessary in places, and a small pond would have to be filled in. There was also a public footpath across the Llandaff Fields, which it would be necessary to temporarily divert to a slight extent. Some out-buildings adjoining a cottage would have to be removed, and the road leading to what would be the entrances to the show-yard would have to be widened.

Subject to satisfactory assurances being received from the Corporation that the recommendations of the Committee of Inspection would be carried into effect, the Committee of Selection recommended the acceptance by the Council of the invitation to the Society to visit Cardiff in 1901.

The official answers to the Society's schedule of queries, signed by the Mayor and Town Clerk of Cardiff, accompanied by an Ordnance map, showing the portions of Llandaff Fields and Lord Bute's property which it was proposed to offer as a site for the show-yard, were laid upon the table, and a Deputation from the borough and district of Cardiff had been asked to attend that day to tender the formal invitation to the Society.

This report having been received,

Lord TREDEGAR introduced a deputation from the town of Cardiff and the rest of South Wales, consisting of the Mayor of Cardiff (Mr. Alderman Thomas Morel), the Town Clerk of Cardiff (Mr. J. L. Wheatley), Mr. Alderman Carey, Mr. Alderman T. W. Jacobs, Mr. Alderman Trounce, Mr. Councillor J. Tucker, Mr. E. W. M. Corbett, Mr. Clifford Cory, Mr. E. A. Knox, Mr. R. Thurston Bassett, Captain Homfray, Mr. T. D. Alexander, Mr. W. Harper (Borough Engineer), Mr. T. A. Riddell, and Mr. R. Templeton.

Lord TREDEGAR said they were anxious to lay before the Council their reasons for asking the Society to accept the invitation, which had already been tendered, to visit Cardiff in 1901. He understood that certain stipulations had been made by the Council, which the Mayor was prepared to answer, and he should perhaps best suit the convenience of the Council by at once introducing the deputation to them.

The Mayor of CARDIFF said that, as Chief Magistrate of that town, he had the honour to formally tender to the Society a cordial invitation to hold its Country Meeting for the year 1901 at Cardiff. The last Royal Show held there was so far back as 1872. The Corporation of Cardiff had invited the Royal Agricultural Society to hold in their town its Country Meeting for the year 1900 when—in the usual rotation—their district would ordinarily have been visited; but the unfortunate epidemic at

Maidstone involved the postponement of the Society's visit to South Wales from 1900 to 1901; and the Corporation immediately invited the Society to the town for the latter year. He mentioned these facts to show that there existed an earnest wish that the Society should visit Cardiff. The site now offered in their town was one which, he believed, would meet with approval. It was situated but a mile and a quarter from the centre of the town; and he was pleased to learn that the Society's representatives, who had visited the land, had expressed a favourable opinion with regard to it. The only thing that he was desired to ask, if their invitation was accepted, was that the Society should take down as small a number as possible of the hedges and fences of that portion of Llandaff Fields which might be required. As to that part of Llandaff Fields lying to the west of the footpath, a very strong desire and special request had been made to the Corporation that the hedges and fences thereon should not be interfered with; and in order to prevent any difficulty occurring as to the user of a portion of the Llandaff Fields for the purposes of the show, a line had been drawn upon the map which the Council had before them. This, it was believed, would obviate the necessity of removing the fences in the part of the Fields referred to. The only part of the show-ground which would have fences remaining around it within the enclosure would then be part of a field of about two acres in extent, immediately on the western side. The Corporation believed that by this arrangement all the land necessary for the show would be secured, and they trusted that the Council of the Royal Agricultural Society would deal with this little difficulty of theirs in a generous spirit. He did not think that this would materially affect matters, and hoped the Society's officials would be able to arrange it without causing inconvenience. He would like to inform the Council that Lord Llangattock had written expressing his inability to join their deputation, but adding that "if the invitation to visit Cardiff were accepted, the Society would have a most cordial and enthusiastic reception and a spirited show, and that the good accommodation offered and the splendid show-ground would all tend towards success." Other local gentlemen had also written to support their invitation to the Council. He might add that many important societies and institutions had held their meetings at Cardiff, and had, he believed, gone away completely satisfied. So far as the Royal Agricultural Society was concerned, he could assure them of a most hearty and enthusiastic welcome, and he hoped the Council would in their wisdom see their way to accept the invitation thus most cordially and sincerely given.

Mr. E. W. M. CORBETT said that he was instructed by the Marquis of Bute to say that if the Society honoured the town of Cardiff with a visit, his Lordship would do everything that he possibly could to facilitate their operations, and to render the gathering a success.

Mr. CLIFFORD CORY, as representing the mining industry of South Wales, very warmly supported the invitation, and said that the valleys from which coal comes had teeming populations connected with Cardiff by exceptional railway facilities, which would ensure a large number of visitors to what he hoped would be a very successful show. Moreover, the mining industries were considerably interested in Agriculture, and were very large purchasers of hay, corn, and horses. They therefore took a deep interest not only in Agriculture generally, but also in the particular invitation which the Council were then considering. Cardiff was the centre of a large agricultural and colliery district, and was the only town in South Wales easily accessible from all parts, and at which a show could be expected to be held in that part of the country.

Lord TREDEGAR said it might best suit the convenience of the Council if he then made the few remarks he had to offer on the subject. He had come there with great pleasure to support the invitation from Cardiff and district to hold the "Royal" Show there in 1901. He understood that certain conditions had been

made by the Royal Agricultural Society, which he had no doubt would be satisfactorily met, and he took it that all the Council required was an answer to the various questions they had asked. The merits of the colliery and agricultural districts surrounding Cardiff would be perfectly well known to them without his enlarging upon the subject. He would add, however, that but for the fortunate fact of their possessing in Lord Bute a representative of what was considered in some quarters an obnoxious class, viz. a great landowner, they would not have been able to offer to the Society a site large enough for the purposes of the Royal Show.

In reply to an observation from Mr. CRUTCHLEY, the Mayor of CARDIFF said a deputation from the ratepayers had approached the Corporation with respect to the contemplated removal of certain hedges, and he trusted the Council would see their way to favourably consider this matter.

Mr. SANDAY observed that, whilst he was sure the Council would wish to meet the views of the Local Committee in every possible way, he was afraid that, if the limitation of the show-yard now proposed were insisted upon by the Corporation, it would destroy the utility of the ground for the purposes of the Society's show, as it would entirely spoil the site.

The MAYOR said that the deputation had undertaken to put the matter before the Council, and to ask them to endeavour, if possible, to meet the difficulty.

Mr. SANDAY said that of course the Council would do this, but it was absolutely necessary for the fences on the west side of the ground to be taken down.

Mr. Alderman CAREY explained that there were footpaths running through the fields which had been purchased by the Corporation, and certain of the ratepayers had rather insisted upon the importance of these being left alone; but the deputation felt they must leave the matter in the hands of the Council. He would only add, as a forecast of the probable success of the show, that when the Society paid them a visit in 1872, their population was only 54,000, in 1891 it was 180,000, and he hoped by 1901 it would be over 200,000. There was within a radius of 100 miles a population of 2,500,000.

Mr. SANDAY pointed out, with regard to the removal of the hedges, that the interference would only be of a temporary nature. They would simply be taken down and replaced, as was done at the Society's Chester Meeting of 1893, and in two or three years the hedges would have resumed their natural appearance.

Mr. CRUTCHLEY felt it was essential that there should be no doubt left in the minds of the Local Committee on the subject of the particular fence referred to, because he considered it would be quite impossible to make a satisfactory show-yard if they were unable to extend the site beyond the bounds of that fence. He thought that after the remarks of the Mayor of Cardiff there was no danger of misunderstanding on this important point; and, that being so, he had great pleasure in formally moving:—"That the Country Meeting of 1901 be held at Cardiff on the Llandaff Fields, and on the adjoining portions of Lord Bute's estate, subject to the usual formal agreement being entered into by the Corporation embodying their answers to the Society's printed Schedule of Queries, and to the recommendations of the Committee of Inspection."

Mr. SANDAY, in seconding the motion, said he believed from what he had seen of Cardiff that the Society would receive a splendid reception there. The energy and enterprise of the citizens, which had developed the town as it now stood, would undoubtedly be instrumental in making their show of 1901 a great success.

Mr. Crutchley's motion was then put to the Council and carried unanimously, and the PRESIDENT having thanked the deputation for their attendance, and expressed the pleasure of the Council at accepting the invitation from Cardiff, the deputation withdrew.

[At a later stage of the proceedings, after the Deputation had left the building, a telegram was received from a firm of solicitors at

Cardiff, followed subsequently by a letter to the same effect, notifying that an injunction would be applied for in the event of any encroachments on Llandaff Fields taking place in connection with the Society's Meeting of 1901. This was felt by the Council to be a matter for the Corporation of Cardiff to deal with, as the Society had, on the invitation of the Corporation, agreed to visit Cardiff on certain clearly defined conditions, which it rested entirely with the local authorities, and not with the Society, to fulfil. A reply to this effect was, on the motion of Mr. CRUTCHLEY, seconded by Mr. SANDAY, ordered to be forwarded to the senders of the telegram and letter.]

The Reports of the various Standing Committees were then presented and adopted as below:—

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the period ended May 27, 1899, as certified by the Society's accountants, showed total receipts amounting to 770*l.* 10*s.* 10*d.*, and expenditure amounting to 2,286*l.* 18*s.* 10*d.* Accounts amounting in all to 7,386*l.* 1*s.* 4*d.* had been passed, and were recommended for payment. The Committee recommended the appointment of Messrs. Wigan, Mercer, Tasker and Co., as local bankers for the Maidstone Meeting.

House.

Sir NIGEL KINGSCOTE (Chairman) reported that instructions had been given for the Society's device to be illuminated as usual on the day appointed for the celebration of Her Majesty's birthday, viz. Saturday, June 3rd. They recommended that the Society's seal be affixed to a new certificate of Harewood House Debenture Stock.

Journal.

Sir JOHN THOROLD (Chairman) reported that the Editor had submitted in draft the contents of the next number of the Journal, which was to include an article on Stilton cheese by Mr. Dugdale (see page 351), and that various suggestions had been made for articles and notes. The Committee had considered the suggestion made at the general meeting by Sir John Swinburne, viz.:—

> "That the reports of the Council should in future be published and despatched to the members of the Society fourteen days before the date of the General Meeting."

and had agreed upon the following reply:—

> This is a question which has been fully considered by the Council upon three previous occasions, viz. on March 7th, 1888, June 5th, 1889, and February 7th, 1894. The two general meetings of the Society, to which printed reports are presented by the Council, are held respectively on May 22nd (the anniversary general meeting), and on the Thursday of the Smithfield week. The report of the Council to the May meeting is prepared on the first Wednesday in May, but cannot be immediately issued, owing to the necessity for including in it details of the entries of stock, poultry, produce, &c., which have been made for the ensuing Country Meeting, for which the entries do not close until May 15. In recent years the Report has been communicated as soon as it is complete to the agricultural papers, in time for publication prior to the meeting, so that members may have the opportunity of ascertaining its contents beforehand; and a summary of the present report appeared last week in several papers.
>
> Looking to the usual attendance at the general meetings, the Committee could not in any case recommend that the serious expense of printing and posting to each member the half-yearly reports should be incurred.
>
> Copies of each half-yearly report are, however, always available by 11 o'clock upon the day of the meeting for the use of those members who are desirous of perusing it in anticipation of the meeting at noon; and the Secretary has been instructed to post a copy of the Report, as soon as it is ready for issue, to any member of the Society who may express a wish to receive it.

A letter had been received from the Meteorological Office stating that owing to reductions in the expenditure of the Office, it was not intended to continue the issue of free telegraphic Hay Harvest Forecasts to selected recipients in different parts of the country. The Committee recommended that the Secretary be instructed to express the regret of the Council at this decision, and to state that they would be glad to confer with the Council of the Meteorological Office as to the means by which the issue of these useful forecasts might be continued.

Chemical and Woburn.

Mr. WARREN reported that a copy of the accounts of the Woburn Experimental Farm for the year ended March 31, 1899, had been laid upon the table, and that various applications for permission to visit the farm on specified dates had been acceded to. Arrangements had been made for the supply of separated milk for the purpose of the proposed experiments in feeding calves.

Botanical and Zoological.

Mr. WHEELER reported that the Committee had decided to collect further specimens of grain of this year's harvest, and directions had been given to the Consulting Botanist on the subject. He also reported that preliminary experiments as to the eradication of charlock and other weeds had already been commenced, and Dr. Voelcker had been requested to keep under observation the plots experimented upon, particularly with reference to the extent to which seeds grow again after being apparently destroyed, and how far the application of sulphate of iron and sulphate of copper affects the clover or other crops in the field. The Committee recommended that the best thanks of the Society be given to Mr. Hornsby for his assistance in these experiments.

The Zoologist had presented the following report:—

Report of Zoologist.

Insects generally seem to have been active during May, though no widespread attacks have been reported. Many applications of interest have been received by the Zoological Department. Of the commoner crop pests the Wheat Bulb Fly and the Crane Fly, Grub, or "Leather Jacket" have been the subjects of inquiry from more than one quarter.

Advice has been repeatedly asked with regard to grain weevils. The most satisfactory insecticide for these pests is certainly carbon bisulphide, used with the necessary caution. An ounce of this poison placed in an open vessel on the top of grain in a tight bin will suffice to free 100 lb. of grain from the weevil. It may even be sprinkled over the surface without damage to the grain. A naked light must not be brought near until the bin has been opened for some time, and the smell has passed off, for the poison is very inflammable.

The Spotted Millipede (*Julus guttatus*) has been accused of injuring various kitchen-garden plants. There is often a doubt as to whether this creature is the original cause of injury, or whether it only attacks something already partially decayed. In the present instance, beans alleged to be infested by it were sent, and they were found to have been previously badly injured by the Bean Beetle, *Bruchus*. In any case, the millipedes certainly aggravate the injury. It is well to bait for them with slices of mangold, which must afterwards be dug up and destroyed.

A case of injury to young larch roots by the true Cockchafer (*Melolontha vulgaris*) was reported from Northamptonshire, and has furnished an opportunity for the trial of the ammoniacal liquor from gasworks as a remedy. The Summer Chafer (*Rhizotrogus solstitiali*) has also been at work in some districts.

Grubs infesting the rectum of a horse were sent for identification and advice. They were recognised as the larvæ of *Gastrophilus hæmorrhoidalis*, a fly closely related to the more common *G. equi*, generally known as the Horse Botfly. In the case of this particular species, the grub does not remain so long in the horse's stomach, but descends to the rectum, where it re-attaches itself. If a horse is in good condition, it may harbour many such grubs without any signs of distress, but, if sickly from other causes, it seems to suffer greatly from the parasite. Dosing a horse to free it from the grubs is not generally advisable. In the first place, it is generally when they are leaving the animal of their own accord that they are noticed, and secondly, the medicines often do more harm than the grubs. The best way is to feed up the animal and to groom it well during the hot weather, so as to remove any eggs that the fly may have attached to its hairs; otherwise the irritation, when the grubs hatch out, induces the horse to lick the place, and thus convey the pest to its stomach.

Another foreign pest—a "Flea-Beetle" attacking vines in California—has been inquired about. Information was sent as to the occurrence and treatment of a similar insect which in this country sometimes attacks hops.

(Signed) CECIL WARBURTON.

May 30th, 1899.

Veterinary.

The Hon. CECIL T. PARKER (Chairman) reported that for the horse-shoeing competition to be held at Maidstone twenty-four entries had been received for Class I. (light horses), and thirty-one entries for Class II. (heavy horses). He also reported that the licence for the exhibition of pigs at Maidstone, promised by the President of the Board of Agriculture, had been received. The Committee recommended that, in compliance with the requirements of the licence, the Secretary of the Society should be formally appointed to receive the declarations and to sign the permits required by the Swine Fever (Movement) Order of 1898. The Committee had given further considera-

tion to a letter from the Highland and Agricultural Society of Scotland as to the elimination of tuberculosis, and had agreed upon an answer to be sent thereto. It had also been decided to recommend to the Council that experiments should be carried out by the Society on a limited scale at the Royal Veterinary College, such experiments (which are to be commenced forthwith) to be under the supervision of a Sub-Committee consisting of Lord Brougham and Vaux, Lord Arthur Cecil, and Sir Nigel Kingscote.

On the motion of the Hon. CECIL PARKER, seconded by Sir NIGEL KINGSCOTE, a sum not exceeding 200*l.* was placed at the disposal of the Sub-Committee for carrying out such experiments.

A letter had also been received from the Highland and Agricultural Society, with reference to certain experiments carried out by Professor Cossar Ewart on the science of heredity at Penicuik, and it was decided that before definitely replying thereto a Sub-Committee, consisting of Lord Arthur Cecil, Sir Jacob Wilson, and Mr. Chandos-Pole-Gell, should take the opportunity of visiting Penicuik at the time of the Highland Show, to be held at Edinburgh from July 4th to 7th, and should report thereon to the Committee at their next meeting, to be held on July 25th.

Professor McFadyean had presented the following report:—

ANTHRAX.—During the first twenty weeks of this year 224 outbreaks with 454 animals attacked have been reported, as against 254 outbreaks with 408 animals attacked during the same period of last year.

GLANDERS.—There has been a sensible decline in the prevalence of this disease during the present year, the outbreaks for the first twenty weeks numbering 259 with 469 animals attacked, as against 298 outbreaks and 556 animals attacked during the corresponding period of 1898.

SWINE-FEVER.—For the first twenty weeks of this year the outbreaks are forty-one in excess of those for the same period of last year, the figures being 1,086 and 1,045 respectively.

RABIES.—No case has been reported during the month of May, and only one case during the current year, while eleven cases were notified during the first twenty weeks of last year.

MISCELLANEOUS.—During the month of May morbid specimens from thirty cases of disease have been forwarded to the Research Laboratory at the Royal Veterinary College for examination. These included another case of sarcoptic mange in the ox. As in the case previously reported, the disease had been contracted during exhibition at a show.

Stock Prizes.

Mr. SANDAY (Chairman) reported that the entries of live stock which had been received for the Maidstone Meeting were fairly up to the average.

Implement.

Mr. FRANKISH (Chairman) reported that the final arrangements for the trials of implements entered in the various classes at the Maidstone Meeting had been made. The question as to the entry as "new implements" for silver medals of machines of the same description as those for which prizes were offered by the Society had been considered by the Committee, and they recommended that in future no implement should be entered as a "new implement," or be eligible for a silver medal, in the same year in which prizes are offered for trials of implements of that class.

The Committee had further considered the subject of the threshing of barley referred to them by the Journal Committee (see page lvii), and were of opinion that the damage to barley arises to some extent from the conditions of harvesting, but more particularly from the improper management of the threshing machine. If the maltsters would furnish the Society with an exact account of their requirements, showing the state of grain necessary for their wants and to enable growers to command the highest market value, the Committee recommended that the Society should circulate to all their members a leaflet containing such opinion of the maltsters, to be illustrated with suitable diagrams.

The suggestion made by Sir John Swinburne, at the general meeting, respecting a further trial of portable oil engines at the York Meeting, had been considered, but the Committee had decided that as the trials for the Meeting of 1900 had already been settled, they could not recommend the adoption of the suggestion at this particular time.

The following regulations for the trials of horse cultivators and steam-diggers at York in 1900 had been

finally approved, and were ordered to be published:

PRIZES FOR CULTIVATORS AND DIGGERS.

In connection with the York Meeting of 1900, the following prizes will be offered:—

	£	£
Class I. General purpose horse-power cultivators	40	20
Class II. Self-moving Steam Diggers	40	20

Regulations for Trials.

1. No exhibitor may enter for competition more than one implement of the same construction. The decision of the Stewards as to whether differences in the construction of implements are sufficiently great to constitute them different implements shall be final and binding.

2. The trials will be held (weather permitting) in the neighbourhood of York in the week preceding the Show, the exact date to be determined by the Stewards. Notice of the place and date of the trials will be posted to every competitor as soon as possible after they have been fixed, and all implements entered for competition must be delivered at the place of trial by the date fixed in that notice.

3. Every competitor must himself provide for the delivery of his implement to the place of trial, and for its removal at the conclusion of the trials to his stand at the York Meeting.

4. Each competitor must make his own arrangements for men to work the implement which he has entered, and must have a responsible representative in attendance at the trials to give any required information. The Society will find horses to work the cultivators (Class I.), for any competitors who desire it, provided that not less than a fortnight's notice is given to the Secretary, and in the case of the steam diggers (Class II.), will provide the necessary fuel and water.

5. Exhibitors and their servants must give every facility to the Stewards by preparing their exhibits for inspection. Any exhibitor, after having had due notice, will be liable either to have his exhibit worked at his own risk in his absence, or to have it removed altogether from the trial field, as the Stewards may decide, and without any responsibility attaching to the Society in consequence.

6. The competing implements will be tried both on heavy and light land.

7. Each implement will have to cultivate a given area of land to such varying depths as the Judges may think fit, and may be tried on varying lands as to consistency of soil or climatic condition.

8. In Class I. the selected implements will be tested for draught by the Society's dynamometer; and in Class II., the coal and water consumption and the power indicated by the engines for a given amount of work will be recorded.

9. The points to which the special attention of the judges will be called are:—

1. Quality and quantity of work done on both heavy and light land in a given time.
2. Ease of adjustment.
3. Facility of handling.
4. Draught.
5. Weight.
6. Price.
7. Simplicity of construction combined with strength.

And in Class II. only—

8. Power and economy of fuel and water.
9. General adaptability of engine to other purposes.
10. Facility in setting to work.

10. Should the judges find any number of implements to be of practically equal merit, they are empowered to bracket them as equal, and so divide the prize-money.

11. The entries for these prizes must be made on or before Thursday, March 15, 1900, and must be accompanied by a deposit of 5*l*. for each entry in Class I., and 10*l*. for each entry in Class II. Such deposit will be forfeited if the implement is not submitted for competition at the time appointed for the trials, and is not exhibited at the York Meeting.

General Maidstone.

Earl SPENCER (Chairman) reported that the general arrangements for the Maidstone Meeting were in an advanced state, and that all the departments of the show would open on June 19, when the judging would take place. On Tuesday, June 20, H.R.H. the Prince of Wales had expressed his intention of visiting the show; and on that day also there would be a large number of foreign visitors present from various parts of the Continent, an elaborate excursion having been arranged by the railway authorities. Amongst these visitors would be the members of the Grande Harmonie de Roubaix, consisting of 110 performers, and this noted band had kindly undertaken to give a musical selection in the show-yard from 1 p.m. to 2.30 p.m. on that day. The arrangements for the other days would be as usual.

Show-yard Works.

Mr. CRUTCHLEY, in the absence through domestic affliction of Sir Jacob Wilson, reported that the buildings for the implement yard at Maidstone were nearly completed. The grand stand, pavilions, dairy, and stock-yard were in a forward state. The water pipes had been satisfactorily tested, and there was a plentiful supply of water. The Committee had discussed various details connected with the show-yard, and had given directions regarding them.

Education.

Lord MORETON (Chairman) reported that the Committee had con-

curred in a suggestion made by the Highland and Agricultural Society that, in order to comply with Regulation 8 of the syllabus for the Examination in Dairying, a definite certificate be required of each candidate giving satisfactory evidence of his or her having taken part in practical dairy work upon a farm for a period of not less than twelve months—three months at a dairy institute to count as if spent upon a farm. They had given consideration to the points raised by Mr. H. S. Daine at the general meeting on Monday, May 29:—(*a*) With reference to the suggestion: "That in future the detailed tabular statement of marks gained in the Society's Examination should be published as was done up to and in 1894," they were unable to add anything to the decision of the Council of May 29, 1895, "that in future the detailed marks of the examination be not published, but that the Secretary be authorised to satisfy inquirers as to the particular subjects in which they may have failed." (*b*) With reference to the other question raised by Mr. Daine as to candidates for the Society's Examination in Agriculture being required to produce evidence of having spent two years on a farm, the Committee did not think that this could be satisfactorily carried out.

For the Society's Examination in the Science and Practice of Agriculture, held from May 9 to 13, forty-four candidates had entered, of whom forty-two (the same number as last year) competed. The Committee presented their detailed report upon the Examination (see page 377).

Dairy.

Mr. DUGDALE (Chairman) reported that the programme of demonstrations in the dairy, and arrangements for the supply of milk for the cream separator trials at the Maidstone Meeting, had been finally settled and approved. A paper by the Chairman on Stilton cheese-making had been completed, and would appear in the next number of the Journal (see page 351).

"Queen Victoria Gifts" Fund.

Sir WALTER GILBEY reported that, following the precedent of 1898, the three Trustees of this fund had decided that a sum of 250*l*. should be granted for 1899, in twenty-five grants of 10*l*. each, as follows:—Five grants of 10*l*. each to males, five grants of 10*l*. each to married couples, fifteen grants of 10*l*. each to females.

International Agricultural Conference, 1900.

The SECRETARY said that as a member of the Commission Internationale d'Agriculture, he had been requested to give publicity to the fact that an International Congress of Agriculture had been organised in connection with the Universal Exhibition of next year at Paris, and would be held from July 1 to 8, 1900. The work of the Congress would be divided into seven sections, details of which appeared in the official programme, of which he laid copies upon the table.

Miscellaneous.

The Society's seal having been affixed to a new certificate of Harewood House Debenture Stock, and other business having been transacted, the Council adjourned until Wednesday June 21, at 12 noon, in the Maidstone show-yard.

Proceedings at Anniversary Meeting of Governors and Members,

HELD AT THE SOCIETY'S HOUSE, 13 HANOVER SQUARE, LONDON, W.

MONDAY, MAY 29, 1899.

THE EARL OF COVENTRY (PRESIDENT) IN THE CHAIR.

THE Sixtieth Anniversary General Meeting of the Governors and Members of the Royal Agricultural Society of England was, in order to comply with clause 6 of the Charter, held *pro formâ* on May 22, 1899 (Whit-Monday), Sir Walter Gilbey, Bart., in the chair, but was immediately adjourned until noon on the following Monday, May 29, 1899, when it was held at the Society's House, 13 Hanover Square, W., the Earl of Coventry (President) in the Chair.

Present:—

Trustees.—H.R.H. the Prince of Wales, K.G., Sir Walter Gilbey, Bart., Colonel Sir Nigel Kingscote, K.C.B., Sir John Thorold, Bart., the Duke of Westminster, K.G.

Vice-Presidents.—Mr. H. Chandos-Pole-Gell, the Right Hon. Sir Massey Lopes, Bart., the Earl of Ravensworth, Sir Jacob Wilson.

Other Members of Council.—Mr. J.H. Arkwright, Mr. Alfred Ashworth, Viscount Baring, Mr. J. Bowen Jones, Lord Brougham and Vaux, Lord Arthur Cecil, Mr. F. S. W. Cornwallis, M.P., Mr. Percy Crutchley, Mr. James Hornsby, the Earl of Jersey, G.C.M.G., Mr. C. S. Mainwaring, Mr. Henry D. Marshall, Mr. T. H. Miller, the Hon. Cecil T. Parker, Mr. Albert Pell, Mr. F. Reynard, Mr. H. P. Ryland, Mr. G. H. Sanday, Mr. Alfred J. Smith, Mr. Henry Smith, Mr. E. W. Stanyforth, and Mr. Martin J. Sutton.

Governors.—The Rt. Hon. Walter H. Long, M.P., Sir John Swinburne, Bart., Mr. W. F. Holt Beever.

Members.—The Rt. Hon. Sir Richard Paget, Bart., Sir Edmund Verney, Bart., Messrs. Arthur W. Arkwright, Charles E. Ashworth, J. Blakiston-Houston, M.P., Arthur Carey, H. S. Daine, T. H. Elliott, C.B., J. Kersley Fowler, Ernest H. Godfrey, H. J. Greenwood, J. H. Howard, R. Hodgkinson, Frederick King, R. M. Knowles, J. R. Markby, Lieut.-Col. W. W. Maude, Messrs. C. Middleton, Claude M. S. Pilkington, Clare Sewell Read, G. F. Sheppard, Arthur Smith, F. C. Southwell, A. J. Stanton, H. A. Wakeman-Newport, E. J. Waterman, W. C. Watson, the Rev. J. C. Wharton, Messrs. T. P. Wilkes, M. D'Arcy Wyvil, M.P., and others.

Officers.—Sir Ernest Clarke, Secretary; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. J. E. Compton-Bracebridge, Assistant Director.

The SECRETARY having read the Bye-laws governing the transaction of business at the anniversary general meetings,

Election of President for 1899–1900.

The PRESIDENT, in calling upon Mr. Walter Long to move the first resolution, said, on behalf of the Society, how very glad they were to see Mr. Long amongst them, and to give him a hearty welcome. His presence was, indeed, another proof of the goodwill he had always shown towards the Society.

The Right Hon. WALTER LONG, M.P., in moving "That H.R.H. the Prince of Wales be elected as President of the Society for the year following the Maidstone Meeting," said that he could not but regard it

as a great compliment that, by the courtesy of the Executive of the Society, had been paid to him, in placing in his hands the moving of this resolution. Although in itself most agreeable, it was, by the nature of its subject, difficult to discharge adequately without making an undue claim upon the patience and attention of his auditors. The association of His Royal Highness with that great and historic Society had extended over very many years. He believed that it was at a very early period of His Royal Highness's life that he first attended a show of the Society—so long ago, in fact, as the year of the Great Exhibition in 1851, when, as a lad of $8\frac{1}{2}$ years, he visited the Society's show of that year in Windsor Park. Since then His Royal Highness had manifested the greatest possible interest in agriculture and in the welfare of the Society, not only by his attendance at its shows, and by becoming a regular and successful exhibitor thereat, but also by occupying, on several occasions, the responsible position of President. If anyone desired to find evidence of the capacity of His Royal Highness to fill that position, they would find it in the cursory study of the speeches which His Royal Highness had addressed, from time to time, to the members of this Society. His Royal Highness had not failed to call the attention of all the members of the Society, and of the public in general, to the immense value of the work which the Society had done in connection with the health of the stock of the country; and the fact that in the year 1866 no show of the Society could be held because of the prevalence of cattle plague was one which ought to bring to their minds the satisfactory assurance that the Society had done splendid work, and had not done that work in vain. This was evident when they realised that at the present time the health of the live stock of the country was better than it had ever been before. Horned stock presented a clean bill of health; while, with regard to stock generally, this country held a position which was not occupied by any other nation in the world.

He knew they would agree with him that His Royal Highness's claims to the post to which they were about to elect him would be great and overwhelming if they rested alone upon the fact that he occupied, and occupied so well, the distinguished and illustrious position of their Prince of Wales; but the claims that he had to their confidence and suffrages rested upon an even surer foundation. It rested upon their knowledge, drawn from past experience, of the determination of His Royal Highness, when he accepted a position, not to be a mere figure-head, but a practical working leader; and, considering the numerous calls upon the Prince's valuable time, this formed an additional claim upon their confidence and gratitude. There were gentlemen present who, with himself, had had the privilege of sitting under the presidency of the Prince of Wales while he was conducting a business meeting, and they would agree with him that he was using no exaggerated language when he said that His Royal Highness was unequalled in his grasp of detail, and his prompt and clear discharge of the business of any meeting over which he presided. Those were the characteristics which impressed themselves upon English people. They had long been accustomed to the charge that they were a "nation of shopkeepers." If this meant that they liked their business to be efficiently, promptly, and expeditiously discharged, he ventured to say they would none of them regard it as a term of reproach or discredit. He would ask them to adopt with acclamation the resolution which he had proposed, believing that it would be in the highest and best interests of the Society, and of agriculture as a whole. He therefore invited them to take the first step towards adding another successful and glorious show to their already brilliant record, by asking His Royal Highness to do the Society the high honour of accepting once again a position which he had previously held with distinction to himself and with advantage to them. (Cheers.)

Mr. Clare Sewell Read said he had the honour and pleasure to second the resolution which had been moved by the President of the Board

of Agriculture. He thought he was right in saying that the last time His Royal Highness filled the office of President was on the occasion of the Society's show being held at Norwich. As a Norfolk man, and still a Norfolk farmer, he could only add that he was quite sure that the news would be hailed with delight throughout that county, as soon as it was known that His Royal Highness had again undertaken the duties of President of the Royal Agricultural Society.

The PRESIDENT said that although there could be no doubt whatever as to the passing of the resolution which had just been moved and seconded, it was necessary, in accordance with precedent, to formally submit it for the acceptance of the meeting, and he was sure it would be carried by acclamation. (Cheers.)

The motion was then put, and carried by acclamation.

H.R.H. the PRINCE OF WALES, whose rising was greeted by loud applause, said: I consider it a very high honour that you have again elected me as President of this great and important Society. The words which have fallen from my friend Mr. Long are, I feel, far too kind and flattering. I will only say that whatever my duties may be—and I do not think they will be very onerous—they will be cordially and cheerfully performed to the best of my ability. It is a long time since I was first associated with this great Society. I have already occupied the post of President on three different occasions, first at Manchester in 1869, then at Kilburn in 1879, and thirdly at Norwich in 1886; and I also, to a certain extent, took the Queen's place in 1889, when she was President of the Society at the memorable show at Windsor. I most readily assented when I was asked to become President for the fourth time, when the Show is to be held at York, and I have little doubt that it will be a very successful meeting. I thank you once more for the kind reception which you have given to the resolution; and I can assure you that the deep interest I take in everything regarding agriculture will always remain the same. (Cheers.)

Election of Trustees.

The PRESIDENT mentioned that eleven of the twelve present Trustees were ready to serve again, but that Sir Archibald Macdonald had retired, owing to advancing years and failing health. To fill this vacancy the Council suggested that Sir John Thorold (now a Vice-President) should be elected a Trustee. He would therefore, in accordance with the Bye-laws, put the motion "That the present Trustees be re-elected, with the addition of Sir John Thorold, in the room of Sir Archibald Macdonald resigned."

This motion, on a show of hands, was carried unanimously.

Election of Vice-Presidents.

The PRESIDENT further explained that Sir John Thorold having just been elected a Trustee, a vacancy arose on the list of Vice-Presidents, and to fill this the Council suggested the name of Sir Jacob Wilson, the senior ordinary member of Council, who had rendered conspicuous services to the Society for the long period of thirty-four years. He therefore put the motion 'That the present Vice-Presidents be re-elected, with the addition of Sir Jacob Wilson, in the room of Sir John Thorold appointed a Trustee."

This motion, on a show of hands was also carried unanimously.

Election of Council.

The election of Members of Council was the next business, and the President appointed Mr. Charles E. Ashworth, Mr. Hubert J. Greenwood, and Mr. Claude M. S. Pilkington to act as Scrutineers of the Voting-papers. These having been duly collected and the report of the Scrutineers' thereon received, it was announced that the twenty-four Members of Council who retired by rotation had been re-elected.

Report of Council.

The SECRETARY having read the salient parts of the Report of the Council to the meeting (see p. 371).

Sir RICHARD PAGET, in moving the adoption of the report, said he might be allowed to express his sense

of the great advantage which the Society was about to obtain by having so able and illustrious a President for the ensuing year. The report pointed to the several scientific departments and the directions in which that great Society had been moving, and to what it had been doing for the benefit of agriculturists at large. Looking to the fact that the Science of Agriculture was becoming daily more difficult, he thought that the agriculture of the future would depend largely upon agricultural education of a practical nature, such as would equip farmers for their life-work, and enable them to produce the best of everything, and nothing short of the very best.

Mr. R. MILLINGTON KNOWLES having seconded the motion,

Sir JOHN SWINBURNE suggested that the report should in future be sent to all the members fourteen days before the meeting, in order that they might have the opportunity of carefully examining its contents beforehand. The report had been carefully drawn up by their able Secretary, and it contained most valuable suggestions, which would go all over their colonies, who looked to that great Society for help and guidance in agricultural matters. He suggested that prizes should be given by the Society for oil engines. Prizes had been given for these engines three or four years ago, but during the last two or three years great strides had been made, and he believed that there was nothing more important than that prizes should be given for portable engines for threshing and grinding corn, cake, &c. He thought the time had come when the Royal Society should offer a handsome prize for the best portable engine for general farming and estate purposes.

The PRESIDENT, in putting the motion for the adoption of the report, said that Sir John Swinburne's observations would receive the attention of the Council.

The report was then adopted.

Suggestions of Members.

In response to the usual inquiry from the Chair as to whether any Governor or Member had any remarks to make or suggestions to offer that might be referred to the Council for consideration,

Mr. H. S. DAINE suggested to the Education Committee that no candidate should be allowed to sit for the proposed new diploma of the Royal and Highland Societies who had not had at least two years' practical experience and work upon a farm. As the motto of the Society was "Practice with Science," he thought that the first was of paramount importance. Science could very well look after itself, but in many cases the practical part was not so good as it might be. He also suggested that the list of the marks gained by each candidate should be published as heretofore. He was pleased to find that the Society had amalgamated with the Highland Society for the purposes of the examination, and believed it would be for the benefit of both Societies.

Vote of Thanks to Chairman.

Sir JOHN SWINBURNE, in moving a hearty vote of thanks to the Earl of Coventry for his courtesy in the chair, said that his Lordship had taken an interest in all branches of the Society, as well as in the work of the Smithfield Club, of which that great Society might be regarded as a kind of offshoot.

Mr. J. KERSLEY FOWLER seconded the motion, and said that there was no one living who had taken more interest in agriculture than Lord Coventry. In the opinion of the farmers of this country a more perfect sportsman did not exist than their Chairman. As a breeder of cattle he was second to none, especially of that beautiful and useful breed, the Hereford.

The SECRETARY then put the motion, which was carried unanimously.

The PRESIDENT, in acknowledging the compliment, said he was reminded that he had taken a great interest in Agriculture for more than forty years; but the older he grew the fonder he became of it, and the more ready he was to place his services in any way he could at the disposal of the Society.

The proceedings then terminated.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Proceedings of the Council.

WEDNESDAY, JUNE 21, 1899.

(IN THE SHOWYARD AT MAIDSTONE.)

THE EARL OF COVENTRY (PRESIDENT) IN THE CHAIR.

Present:

Trustees.—Sir Walter Gilbey, Bart., Colonel Sir Nigel Kingscote, K.C.B., Sir John H. Thorold, Bart.

Vice-Presidents.—Mr. H. Chandos-Pole-Gell, the Earl of Feversham, Lord Moreton, Mr. Charles Whitehead, Sir Jacob Wilson.

Other Members of Council.—Mr. R. C. Assheton, Mr. J. Bowen-Jones, Mr. Victor C. W. Cavendish, M.P., Mr. F. S. W. Cornwallis, M.P., Mr. Percy Crutchley, Lieut.-Col. J. F. Curtis-Hayward, Mr. S. P. Foster, Mr. William Frankish, Mr. James Hornsby, the Earl of Jersey, G.C.M.G., Captain W. S. B. Levett, Mr. C. S. Mainwaring, Mr. H. D. Marshall, Mr. T. H. Miller, the Hon. Cecil T. Parker, Mr. Albert Pell, Mr. J. E. Ransome, Mr. F. Reynard, Mr. C. C. Rogers, Mr. H. P. Ryland, Mr. G. H. Sanday, Mr. A. J. Smith, Mr. E. W. Stanyforth, Mr. J. P. Terry, Mr. E. V. V. Wheeler, Mr. C. W. Wilson.

Officers.—Sir Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. J. E. Compton-Bracebridge, Assistant Director; Mr. R. S. Burgess, Superintendent of the Showyard.

Professor Sir George Brown, C.B.

Mr. R. A. Hamilton Seymour, Honorary Secretary of the Maidstone Local Committee.

Apologies for non-attendance were received from the Earl of Derby, K.G., Earl Spencer, K.G., Mr. J. Marshall Dugdale, Mr. Dan Pidgeon, Mr. Samuel Rowlandson, Mr. Henry Smith, and Mr. Martin J. Sutton.

The minutes of the last monthly meeting of the Council held on May 31 were approved, and the minutes of a Special Council held on June 19 were read and confirmed

Report of Finance Committee.

Sir NIGEL KINGSCOTE (Chairman) reported that accounts connected with the Maidstone Meeting amounting in all to 3,441*l.* 2*s.* 4*d.* had been passed, and were recommended for payment.

Report of Committee of Selection.

Sir JOHN THOROLD (Chairman) reported that information having reached the Society that influential deputations from the National Agricultural Societies of France and Germany were proposing to visit the Maidstone Show, it appeared to the Committee of Selection that the presence of these representatives of kindred Societies in other countries would be an appropriate occasion for linking such Societies with their own by conferring the two vacant Honorary Memberships of the Society upon the heads of the respective deputations, viz.: The Marquis de Vogüé, President of the Société des Agriculteurs de France, and Herr Berndt von Arnim, Chairman of the Directorate of the National Agricultural Society of Germany. The Committee had submitted

their recommendation to the Special Council held on Monday, June 19, and had received the sanction of that meeting to the proposal. Accordingly, at the General Meeting of Governors and Members held on Tuesday, June 20, H.R.H. the Prince of Wales had, at the request of the Council, handed to these two distinguished gentlemen their badges of Honorary Membership.

In order to comply with the terms of the Society's Bye-law 8, it was now his duty formally to move: "That the Honorary Membership of the Society be conferred upon the Marquis de Vogüé, President of the Société des Agriculteurs de France, Paris, and upon Herr Berndt von Arnim, Chairman of the Directorate of the Deutsche Landwirtschafts - Gesellschaft, Berlin, in recognition of their distinguished services to Agriculture; and that the Seal of the Society be affixed to their Diplomas of Honorary Membership."

The Hon. CECIL T. PARKER seconded the motion, which was carried unanimously.

Suggestions made by Members.

The suggestion made by Mr. Samuel Kidner at the General Meeting held on the previous day, that letters addressed to members of the Society at the Showyard should be made available for them at some more central office than at the entrances, was referred to the Showyard Works Committee for consideration.

The suggestion made on the same occasion by the Hon. and Rev. A. C. Baillie-Hamilton, that the judges of Channel Islands cattle might be allowed, when they considered it necessary, to have the animals milked in the ring for the purposes of judging, was the subject of a lengthy discussion.

The Hon. CECIL T. PARKER said he thought that Mr. Baillie-Hamilton was in error when he stated at the General Meeting that he (Mr. Parker) had, when Honorary Director, given permission for cows to be milked in the judging ring. He could not remember ever having given such permission.

Sir JACOB WILSON considered that this matter should be dealt with at once, and not referred in the usual way to a Standing Committee for consideration.

Mr. FOSTER, as Steward of Cattle, thought it would be well that he should put the matter before the Council as it was represented to him. Mr. Hamilton Seymour was the Ring Steward for the Guernsey cattle, and when Mr. Baillie-Hamilton wanted to have three or four cows milked, Mr. Seymour consulted him (Mr. Foster) at once, and he had declined to give his sanction to the proceeding. If it were necessary to test cows in this way they should be sent to the Veterinary Yard in order to be milked, in the same way as horses were sent there to be tested. In his opinion it was unnecessary for the purpose of ascertaining whether an animal was a good milker or not, for it to be milked in the judging ring. He quite agreed with Sir Jacob Wilson that the matter should be dealt with at once. If cows were to be allowed to be milked in the ring, instructions to that effect should come from the Council.

Mr. SEYMOUR explained that he thought it necessary to stop buckets and three men being brought into the ring for these cows to be milked. He at once submitted the matter to Mr. Foster, and was very glad that his action was approved.

Lieut.-Col. CURTIS-HAYWARD did not agree with Mr. Foster. It was sometimes necessary, when there was a very keen competition, to milk an animal, in order to arrive at a proper decision. There was this year a very keen competition in the Jersey cow classes, and the judges had sent three or four animals away to be milked. It was a very moot point as to how one prize in particular should be awarded, and without this additional test the judges could not have arrived at their decision.

Sir WALTER GILBEY quite agreed with what Mr. Foster had said, and totally disagreed with Col. Curtis-Hayward. He thought Mr. Baillie-Hamilton's suggestion quite unnecessary, and recommended that it should lie upon the table.

Sir JACOB WILSON said that whatever might have been done in the past (and he believed it had been

somewhat of an open question—left to the discretion of the stewards and judges), he felt that it was time that some definite rule should be laid down by the Council. The judges were asked to perform certain duties, and it should not be open to them to judge animals except upon equal conditions, viz. that of having been milked dry the night before. Good judges of dairy cattle would know which was the best cow, even with its udder full; and they knew what the beast would be like with its udder empty. The fact was, this was an innovation, and although no one desired to altogether take away from the judges what had been left largely to their discretion, yet he (Sir Jacob) felt that something more definite should be laid down for the future, and that a judge should be requested to decide upon the merits of an animal, under the conditions laid down, at the moment when it was brought before him. He thought that no animal should be interfered with until after the decision of the judges was known, and certainly no cow should be milked in the ring at all.

Mr. CHRISTOPHER WILSON pointed out that if the cows were milked dry the night before the judging took place, they would all be on the same footing the next day.

Mr. CHANDOS-POLE-GELL deprecated the introduction of milking trials into the showyard, and trusted that no innovation of that kind would be allowed.

The Hon. CECIL T. PARKER said he quite agreed with Mr. Foster and Sir Jacob Wilson. Referring to Rule 61, he understood that this Rule had been framed for the very purpose of putting a stop to the interference with animals whilst in the ring. He would like to propose a Resolution that no animal should be milked in the ring during the time of judging.

Mr. FOSTER said that the stewards had interpreted Rule 61 in the same way as Mr. Parker, and had carried out their instructions accordingly.

Mr. CRUTCHLEY thought if they passed such a Resolution the difficulty would still remain, for when the competition was very keen the judges would ask to have the animals sent out of the ring to be milked. He quite agreed that some regulation was required, and that the ring stewards should have definite instructions as to what they were to do.

Mr. TERRY saw no reason why, if the judges wished it, animals should not be taken out of the ring for this purpose.

Mr. CRUTCHLEY said that perhaps it had been misunderstood what the judges were anxious to ascertain in this case. They said they wanted to see the difference in the state of the bag after the milk had been drawn.

After some further discussion Mr. PARKER moved, and Sir WALTER GILBEY seconded, "That no animal in any cow class be allowed to be milked in connection with the judging." This resolution, on being put to the meeting, was carried with one dissentient (Colonel Curtis-Hayward.)

Colonel CURTIS-HAYWARD said that while they were on the subject of milking, he would venture the suggestion that it be an instruction for the future that all females in the cattle classes should be judged before the males. In the Jersey ring, on the judging day, it was a quarter past eleven before the cows came in to be judged; and in many instances the milk was streaming out of them.

On the motion of Sir NIGEL KINGSCOTE, this suggestion was referred to the Stock Prizes Committee, and Mr. SANDAY undertook that it should receive due consideration.

Votes of Thanks in Connection with the Maidstone Meeting.

On the motion of Mr. PERCY CRUTCHLEY (Honorary Director), seconded by Sir JACOB WILSON (Vice-President), it was unanimously resolved:—

That the best thanks of the Society are due, and are hereby tendered—(*a*) to Messrs. Wigan, Mercer, Tasker and Co., for the efficient assistance rendered by them during the Maidstone Meeting; (*b*) to the Borough of Maidstone Police and Kent County Constabulary for the efficient assistance rendered by them in connection with the Maidstone Meeting; (*c*) to the South Eastern and Chatham and

Dover Railways for the facilities afforded in connection with the Maidstone Meeting; (*d*) to the St. John Ambulance Association for the efficiency of the ambulance arrangements in the Showyard during the Maidstone Meeting; (*e*) to Messrs. T. Frost and Co., of Maidstone, for providing the floral decorations in and around the Royal and other Pavilions in the Showyard; (*f*) to Messrs. Shand, Mason and Co., of London, for the provision of fire-engines, and for their efficient arrangements in connection with the fire-station in the Showyard; (*g*) to Messrs. Marshall, Sons and Co., of Gainsborough, for the loan of a steam engine for the supply of motive power to the dairy; (*h*) to the officials of the Maidstone Post Office for the efficient postal and telegraphic arrangements.

On the motion of Mr. PERCY CRUTCHLEY, seconded by Mr. S. P. FOSTER, it was further resolved, "That the best thanks of the Society are due, and are hereby tendered, to Messrs. S. Lance Monckton and R. A. Hamilton Seymour, the Honorary Secretaries of the Local Committee, for their personal and energetic cooperation with the Society and its officials in organising the preparations for the Maidstone Meeting."

Mr. SEYMOUR, who was present, expressed his sincere acknowledgments for this vote.

On the motion of Mr. PERCY CRUTCHLEY, seconded by Sir JACOB WILSON, a letter was ordered to be addressed to the Chief Commissioner of Police, after the conclusion of the meeting, conveying the appreciation by the Council of the very efficient services rendered by the detachment of the A Division of the Metropolitan Police at the Maidstone Meeting.

Letters of thanks were also ordered to be addressed to various local and other firms who had rendered assistance in connection with the Maidstone Meeting.

Matters arising out of Maidstone Meeting.

The SECRETARY drew attention to the award by the judges of Hackneys of the Champion Gold Medal for Females to an animal in class 23, whereas, according to the Prize-sheet, this gold medal was offered by the Hackney Horse Society for "the best Hackney Mare or Filly in classes 19 to 21." Under these circumstances, the Hon. CECIL T. PARKER moved, Mr. FOSTER seconded, and it was unanimously resolved, "That the Champion Gold Medal for Female Hackneys be awarded to the Reserve Champion animal, Mr. Harry Livesey's 'Orange Blossom,' entered in class 19, and numbered 95 in the Catalogue."

Sir GEORGE BROWN presented a report upon the veterinary examination of animals entering the Maidstone Showyard. Fourteen cattle suffering from skin disease, and in such a condition as to render them dangerous to other animals in the Show, had been rejected under Regulation 27 of the Prize-sheet. Two ponies in class 30 had also been rejected, as exceeding the prescribed height (12h. 2in.).

In a second report, Sir George Brown stated that 197 horses, selected by the judges, were examined by the veterinary inspectors on the judging day, and of these eleven were rejected as suffering from the following diseases, viz. roaring, four cases; cataract, four cases; spavin, two cases; side-bone, one case.

York Meeting of 1900.

A General York Committee was constituted of the whole Council, with the addition of not exceeding eight representatives of the York Local Committee, to be nominated by the Lord Mayor of York, the first meeting of the committee to be held on Wednesday, July 26, at 11 A.M.

Cardiff Meeting of 1901.

Mr. CRUTCHLEY reported that Mr. Sanday and himself had that morning received a deputation from Cardiff, consisting of the Mayor (Sir Thomas Morel), the Town Clerk (Mr. J. L. Wheatley), the Borough Engineer (Mr. W. Harpur), Mr. Alderman P. Carey (Chairman of the Local Committee), Mr. Alderman T. W. Jacobs, Mr. Alderman E. Beavan, Mr. James Tucker, and Mr. Veall, with Mr. Illtyd Thomas, to consider the objections which had been raised locally to the enclosing of a portion of the Llandaff fields for the purposes of the Society's Country Meeting of 1901.

The Deputation had submitted a revised plan, showing how, in their opinion, the difficulty might be over-

come, but to this Mr. Crutchley and Mr. Sanday could not quite agree. The counter-proposal made by them was assented to by the Mayor, subject to confirmation by the Corporation of Cardiff. If this compromise could be carried out, the Mayor had expressed himself as convinced that the Society would receive a hearty welcome from an united instead of a divided city.

Miscellaneous.

A letter was read from the Honorary Secretaries of the Poultry Conference to be held at Reading from July 11 to July 13, asking the Society to appoint two Delegates to the Conference. It was resolved to request Colonel Curtis-Hayward and Mr. Dugdale to represent the Society at the Conference.

The Hon. CECIL T. PARKER gave notice of a motion for the July Meeting of Council with reference to the days on which the Showyard should be open to the public in future years.

The Council then adjourned its Ordinary Meeting until Wednesday, July 26, 1899, at 12 noon, at 13 Hanover Square, W.

SPECIAL MEETINGS OF THE COUNCIL,

HELD IN THE SHOWYARD AT THE MAIDSTONE MEETING.

Special Meetings of the Council were held in the Maidstone Showyard on Monday, June 19, Thursday, June 22, and Friday, June 23.

MONDAY, JUNE 19, 1899.

(Mr. W. FRANKISH in the Chair.)

The proceedings were mainly formal in character, except the reception of the recommendation of the Committee of Selection for the appointment of the Marquis de Vogüé and Herr von Arnim as Honorary Members (see *ante*, pp. lxxiii–iv).

THURSDAY, JUNE 22, 1899.

(The Earl of COVENTRY, President, in the Chair.)

Mr. CRUTCHLEY reported that the Stewards had held a meeting that morning to consider a protest which had been received as to the awards originally announced in class 134, for Dairy Cows "in milk, giving the largest quantity of milk containing (on the average of two milkings) 12 per cent. of total solids, of which not less than 3 per cent. shall be fat." He explained that the cow which had given the largest quantity of milk in that class had been disqualified by the Steward of Dairying on the report of the Society's Consulting Chemist that the milk yielded by such cow was "abnormal." The Stewards of Stock had, in accordance with the directions of the Prize-sheet, met to decide this protest, and they had called before them the agent of the exhibitor of the animal in question. It was admitted by him that the cow had for some time been specially prepared and fed for this milking test, and the Stewards were satisfied that the milk it yielded was not normal in character. At the same time they felt that, as the conditions under which the prize was offered had been technically complied with, they would not be justified, in view of this protest having been made, in withholding the prize from the cow in question.

Mr. WHEELER pointed out that the prizes in this class were to be "awarded on the Certificate of the Steward of Dairying." He considered therefore at the time that he, as Steward of that Department, was justified in disqualifying the animal, and he was prepared to take the responsibility for such disqualification. In view of the facts brought under his notice by Dr. Voelcker, as to the unmarketable quality of the milk yielded, he still considered the cow ought to be disqualified; but if the Council thought otherwise, he could of course with their sanction

amend his Certificate of the Prize-winners accordingly.

After observations by Mr. Foster, Dr. Voelcker, Mr. Bowen-Jones, Sir Walter Gilbey, Mr. C. W. Wilson, and others, as to the wording of the regulations and the results of the chemical analysis, Mr. FOSTER formally moved, Mr. TERRY seconded, and it was resolved by 10 votes to 2, "That the recommendation of the Stewards of Stock sustaining the protest made in class 134 be approved and adopted."

Mr. WHEELER thereupon asked for, and obtained, formal instructions from the Council to amend his Certificate of the Prizes won in class 134 as follows:—

First Prize of 15*l.* to Mr. J. F. Spencer, for his cow "Model Maid 2nd" (No. 1097).

Second Prize of 10*l.* to Mr. J. F. Spencer for his cow "Graceful" (No. 1095).

Arising out of this discussion, Mr. CRUTCHLEY remarked that it was the unanimous opinion of the Stewards of Stock that the unsatisfactory conditions under which competitions of Dairy Cows must of necessity be carried out in a Showyard made their continuance inadvisable.

This recommendation was referred to the Stock Prizes Committee for consideration.

Various points as to the awards, and letters arising thereon, were submitted by the SECRETARY. In class 23 the numbered labels for exhibits Nos. 121 and 122 had, according to the report of the Assistant Steward, been placed on the wrong animals, and the mare therefore to which the 2nd prize was awarded by the judges was actually Mr. John Barker's "Lady Millie" (No. 122 in the Catalogue) and not Mr. Barker's "Comedy" (No. 121), which was only entitled to the Reserve Number.

Instructions were given for the amendment of the List of Prize-winners in accordance with this report.

FRIDAY, JUNE 23, 1899.

(Mr. S. P. FOSTER in the Chair.)

Professor Sir GEORGE BROWN presented the following Veterinary Report:—

No outbreak of contagious or infectious disease has occurred amongst the animals in the Showyard. Several cases have been under veterinary treatment, including 13 horses, 1 bull, 1 sheep, and 1 pig. The latter, which was suffering from severe congestion of the lungs, was removed from the Showyard by the owner's request.

The cases which occurred amongst the horses were of a mild type, with the exception of a mare which is at present suffering from acute congestion of the lungs; the groom in attendance has been informed that the animal is too ill to be removed with safety, and has been advised to secure the services of a veterinary surgeon at the conclusion of the Show.

During the Show 10 horses were excused from parade on account of illness, lameness, or injury.

One horse, showing suspicious premonitory symptoms of strangles, was at once removed from the Showyard.

June 23, 1899. (Signed) G. T. BROWN.

A statement of the absentees in the various departments of the Maidstone Meeting was laid upon the table, and the Secretary was instructed to apply for the fines due from exhibitors for animals absent without explanation.

The Council then adjourned until Wednesday, July 26, 1899, at noon.

WEDNESDAY, JULY 26, 1899.

THE EARL OF COVENTRY (EX-PRESIDENT) IN THE CHAIR.

Present.

Trustees.—General Viscount Bridport, G.C.B., Earl Egerton of Tatton, Sir Walter Gilbey, Bart., Colonel Sir Nigel Kingscote, K.C.B., Sir John Thorold, Bart.

Vice-Presidents.—Lord Moreton, Sir Jacob Wilson.

Other Members of Council.—Mr. J. Bowen-Jones, Lord Brougham and Vaux, Mr. Victor C. W. Cavendish, M.P., Lord Arthur Cecil, Mr. Percy Crutchley, Lieut.-Colonel Curtis-Hayward, Mr. A. E. W. Darby, Mr. J. Marshall Dugdale, Mr. W. Frankish, Mr. James Hornsby, Captain W. S. B. Levett, Mr. C. S. Mainwaring, Mr. Henry D. Marshall, Mr. Albert Pell, Mr. Dan. Pidgeon, Mr. J. E. Ransome, Mr. Frederick Reynard, Mr. Alfred J. Smith, Mr. Henry Smith, Mr. R. Stratton, Mr. Garrett Taylor, Mr. R. A. Warren, Mr. J. C. Williams, Mr. C. W. Wilson.

Officers.—Sir Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. Cecil Warburton, M.A., Zoologist; Mr. J. E. Compton - Bracebridge, Assistant Director; Mr. R. S. Burgess, Superintendent of the Showyard.

Professor Sir George Brown, C.B., Professor McFadyean.

The following members of the York Local Committee were also present:—The Lord Mayor of York (Mr. Alderman Border), the Sheriff of York (Mr. J. J. Hunt), Mr. Alderman Foster, Mr. Alderman W. McKay, Mr. Alderman J. S. Rymer, Mr. Francis E. Walker, Mr. G. A. Eason Wilkinson, and Mr. W. H. Andrew (Town Clerk).

Apologies for non-attendance were received from H.R.H. Prince Christian, K.G., the Hon. Cecil T. Parker, Mr. J. H. Arkwright, Mr. Alfred Ashworth, Mr. R. C. Assheton, Mr. H. Chandos-Pole-Gell, Mr. F. S. W. Cornwallis, M.P., Mr. T. H. Miller, Mr. A. E. Pease, M.P., Mr. H. P. Ryland, Mr. G. H. Sanday, Mr. E. W. Stanyforth, Mr. Martin J. Sutton, Mr. J. P. Terry, and Mr. Charles Whitehead.

In the unavoidable absence of H.R.H. the Prince of Wales (President of the Society), the Earl of Coventry, as ex-President, was called to the Chair.

Election of New Members.

The minutes of the last ordinary meeting of Council on June 21, 1899, in the Maidstone Showyard, having been approved, and those of the Special Councils on June 22 and 23, 1899, having been read and confirmed, the election of the following seventy-four members was proceeded with:—

ALLEN, W. H. . Bromham House, near Bedford.
ALLGOOD, Alfred M. . . Nunwick, Humshaugh-on-Tyne.
ANDERSON, R. . . Darnley, Waverley Abbey, Farnham, Surrey.
ARMSTRONG, W. . . Sunderlandwick, Driffield, Yorks.
ARNIM-SCHLAGENTHIN, Count. . Nassenheide, near Stettin, Germany.
ASTLEY, J. W. . . The Brewery, Nelson, Lancs.
*BACH, Philip S. . . Wintercott, Leominster.
BAXTER, A. . . Arden Lodge, Kingswood, Warwickshire.
BERESFORD-PEIRSE, E. F. de la Poer. . Bedale Hall, Bedale.
*BLACKIE, Alfred. . 50, Grovehill Road, Tunbridge Wells.
BRAGG, William. . North Litchfield Manor, near Whitchurch, Hants.
BROOKE, W. J. . . Haughton Hall, Shifnal, Salop.
*BYRON, A. W. . . 176, Piccadilly, W.
CLARKE, Leonard E. . . 9, Chichester Street, London, W.
COOK, Ralph M. . . Roydon Hall, Tonbridge, Kent.
COX, Alex. R. . . Hildenboro', Kent.
CRAWFORD, C. J. . . Miramar, Wellington, N.Z.
CROSS, Thos. O. . . Peel Hall Farm, Ashley, Manchester.
DAVIES, Thomas J. . . The Mount, West Malling.
DE LA WARR, Countess. . The Manor House, Bexhill-on-Sea.
DIXON, Isaac. . Windsor Iron Works, Liverpool.
EDMEADES, Maj.-Gen. H. . . Nurstead Court, Gravesend.
EGGAR, R. B. . . Cedar Cottage, Bentley, Hants.
GIBSON, J. R. . . Felpham House, Felpham.

* Re-instated under bye-law 12.

GOSLING, R. C... Hassobury, Bishop's Stortford.
GOULD, L. F... The Cottage, Bilton, Rugby.
GREENSHIELDS, George.. South Farm, Ryhope, Sunderland.
GUNTER, George G... Wetherby Grange, Yorks.
HARDY, Hon. Nigel Gathorne.. Benenden, Kent.
HAWES, W. J... Wateringbury, Kent.
*HOLFORD, T... Castle Hill, Buckland Newton, Dorchester.
IZON, J. A... Nab Scar, Leamington.
JACKSON, J. A... Sunnyside, Hawkhurst.
JACKSON, Wm... The Albert Works, Preston.
KNIGHT, Geo. E... 3 Lincoln's Inn Fields, W.C.
LAHUSEN, T. H. Gustav.. Bremen, Buenos Aires.
LEGH, J. R. Pennington.. Hall Side, Knutsford.
LUNDH, S. H... Jernbanetorvet, 4i, Christiania, Norway.
MACKENZIE, Colin E... Skelmersdale Road, Clacton-on-Sea.
*MACKLEY, G. T... Queen's Hotel, Upper Norwood.
MAINWARING, H. S... Peover Hall, Knutsford.
MANWARING, Percy.. The Warren, Brenchley, Kent.
MARCHANT, S. W... Gedges, Matfield, Paddock Wood.
MAY, George.. Hermitage Farm, Barming, Maidstone.
MEADE-WALDO, E. G. B... Stonewall Park, Edenbridge.
MILLER, W. G. P... Thisleton, Kirkham, Lancs.
MORRIS, John.. Parc Gwyllt Farm, Bridgend.
MYDDELTON, R. C... Clarendon House, Prospect Road, St. Albans.
NEWDIGATE, Francis A... Weston-in-Arden, Nuneaton.
ONGLEY, Alfred.. Sandling Farm, Maidstone.
*PATTERSON, G. T... 12, Liscar Terrace, West Kensington, W.
PRIOR, H. A. S... Cliff, Rathfarnham, co. Dublin.
RANSOME, Bertram C... St. Edmund's Road, Ipswich.
RASCHEN, H. H... 28 Garlies Road, Forest Hill, S.E.
REES, W. A... 154, Croydon Road, Anerley, S.E.
ROYDEN, Thomas B... Frankby Hall, Birkenhead.
RUNDLE, E. C... Bedford Office, Tavistock, Devon.
SANDWITH, Capt. Lincoln.. Aynho, Banbury.
SAVEALL, W. J... Medway Iron Works, Maidstone.
*SEARLE, B. W. J... Manor House, Cottenham, Cambs.
SILCOCK, T. B... Thornton Hall, Poulton-le-Fylde.
STEWART, Robert.. New House Farm, Allington, Maidstone.
STOKES, R. W... 149, Queen's Road, Finsbury Park, N.
STURGESS, J. M... Penshurst Park, Tonbridge.
TAYLOR, C... Newton, Holywych, Cowden, Kent.
*TELFER, J. S. G... 24, Duke Street, Cardiff.
THOMAS, R. D... The Oaklands, Oswestry.
THOMSON, Herbert G... Woodperry, Oxon.
THORNYCROFT, John Isaac.. Eyot Villa, Chiswick Mall, W.
VEITCH, Andrew.. Court Farm, Aylesford.
VEITCH, Robert.. Cossington Farm, Aylesford.
WATSON, E. T... Snaith, R.S.O., Yorks.
WATSON, Henry.. Greestone Mount, Lincoln.
WOOD, James.. Boughton Monchelsea, Maidstone.

* Re-instated under bye-law 12.

The reports of the several Standing Committees were then presented and adopted as below:—

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the period ended June 30, 1899, as certified by the Society's accountants, showed receipts amounting to 6,630*l.* 8*s.* 8*d.*, and expenditure amounting to 8,108*l.* 18*s.* 9*d.* The accounts for the period ended July 22, 1899, showed receipts amounting to 2,266*l.* 1*s.* 4*d.*, and expenditure amounting to 2,719*l.* 8*s.* 9*d.* Accounts amounting to 10,279*l.* 10*s.* 3*d.*, relating to the Maidstone Meeting, and to 3,480*l.* 0*s.* 2*d.*, arising out of the ordinary business of the Society, were presented and were recommended for payment. The Committee regretted to have to announce that there was a considerable loss on the Maidstone Meeting, but the amount of that loss could not be ascertained until the timber sales had been completed and all the accounts had been received and analysed. The Committee thought it better, therefore, to reserve until the next meeting of the Council any definite recommendation as to the sale of securities to meet the deficiency. The quarterly statement of subscriptions, arrears, and property, as at June 30, 1899, had been laid upon the table and approved.

In presenting this report, Sir NIGEL KINGSCOTE said that the Council would be prepared to learn that the Finance Committee had not on that occasion a satisfactory account to render, owing to the disappointingly small attendance of the public at the Maidstone Meeting, especially on the half-crown days. Only one of the four series of sales of the timber used in the erection of the showyard had as yet taken place, and a great many accounts had yet to be received and examined. The Finance Committee were, therefore, unable at that meeting to make any accurate forecast of the Society's financial position. The Society's shows had now reached such a development that a very large expenditure was compulsorily thrust

upon it in the building of the show-yards, the provision of the necessary staff, and the general administration, which the entry fees paid by exhibitors did not by any means defray, and which it was only possible to recoup by the payments made at the doors by the public who were not members of the Society. It might be frankly admitted that Maidstone was hardly the place at which the Society, had it been actuated only by monetary considerations, would have pitched its showyard during the present year. But as the Council would be aware, it was in accordance with the present scheme of rotation of districts that there should be a show this year in the south of England; and as the Society had not visited Kent for thirty-nine years, that county had a special claim upon their consideration. The Society had received a very cordial welcome from Kent and its capital town, and everything possible was done by the local authorities to make the Meeting a success — which, indeed, in every respect but the financial, it undoubtedly was. At the same time it would be generally felt that now that the rotation was drawing to a close, there might be great advantage in a strong committee considering carefully and deliberately what modifications or alterations in the present show system might be desirable in the future. The Hon. Cecil Parker had given notice on the agenda paper of a resolution with this object, and as he was prevented from being present, he had asked him (Sir Nigel) to move it on his behalf. As he hoped that the principle of Mr. Parker's resolution would be generally accepted, he asked leave to move it now, with the explanation that Mr. Parker desired to postpone for the present another resolution now on the paper as to the shows being kept open on a Saturday.

Sir NIGEL KINGSCOTE then moved, and Mr. PERCY CRUTCHLEY seconded, the following resolution standing in Mr. Parker's name on the agenda paper:—

That in view of the fact that in the year 1902 the present rotation of districts as settled in 1892 will have been completed, and that it will be necessary during the forthcoming year 1900 to come to a decision as to a meeting-place for 1902 in district G—the last of the series—a Special Committee consisting of the Chairmen of the several permanent committees concerned in the administration of the shows (Finance, Veterinary, Stock Prizes, Implement, Show-yard Works, and Dairy), with the Honorary Director and three unofficial members of the Council to be nominated by the Committee, be appointed to consider and report as to any modifications or alterations in the present show system which they may consider desirable after the present rotation is completed.

The CHAIRMAN, in putting the resolution, said it would only be necessary for him to say a few words with regard to it. He thought the general feeling of the Council would be to concur unanimously in the resolution proposed by Sir Nigel Kingscote. There were several parts of the country to which the Society now paid visits where they could hardly expect to make both ends meet; and, having regard to the financial losses incurred at Maidstone, and which might be incurred again in the future, when shows were held in non-populous districts, he thought it would be an excellent thing that the Committee now proposed to be appointed should deliberate on the whole subject of the present show system.

The resolution was then put, and carried unanimously.

House.

Sir NIGEL KINGSCOTE (Chairman) reported that various accounts had been passed and referred to the Finance Committee for payment.

Journal.

Sir JOHN THOROLD (Chairman) reported the issue of two new pamphlets by the Society on "Hedges and Hedge Making," by Mr. W. J. Malden, and on "Stilton Cheese" by Mr. J. Marshall Dugdale. The Committee recommended that the thanks of the Society be given to Mr. Dugdale, Mr. Walter Heape, and Mr. Dan. Pidgeon, for their contributions to the current number of the Journal. The Editor had submitted the draft contents of the next number of the Journal, and various suggestions had been considered for articles and notes. There had been

further correspondence with reference to the close dressing of malting barley, and the Committee recommended the insertion amongst the Proceedings of the Council of a memorandum on the subject, a draft of which had been considered by them, and referred to the Implement Committee.

Chemical and Woburn.

Mr. WARREN reported that the Committee had paid their annual visit of inspection to the Society's Experimental Farm on June 1, and had approved of Dr. Voelcker's report on the progress of the bullock- and sheep-feeding experiments, which were recommended for publication in the Journal. The experiments suggested by Sir John Thorold on feeding calves with separated milk had been commenced. Plans showing the proposed alterations to the farm buildings at Woburn had been laid upon the table. The number of visitors to the farm having of late shown a tendency to increase, it was, in the opinion of the Committee, desirable that those intending to pay a visit to Woburn should communicate beforehand with Dr. Voelcker, so that the officials in residence there might not be put to any unnecessary inconvenience, and that visitors themselves might not carry away an imperfect idea of the progress and scope of the various experiments through the absence of a properly qualified person to give the necessary explanations.

Dr. Voelcker had presented the following report, which had been approved, and ordered to be published in the proceedings:—

REPORT OF CONSULTING CHEMIST.

Salt in Feeding Materials.

In a sample of decorticated cotton cake sent me for analysis I found:—

Salt . . . 1·24 per cent.

On inquiry it was ascertained that the cake was one made up in this country, and the manufacturers said that they added the salt to give a relish to the cake, and because many agriculturists preferred it so.

I should point out that there are several objections to this practice, which, there is reason to believe, is becoming more frequent. Firstly, under the Fertilisers and Feeding Stuffs Act it is not allowable to sell under a name, such as "Linseed Cake," "Decorticated Cotton Cake," &c., a cake to which any material "not disclosed at the time of sale" has been added. Secondly, it is not unfrequently the case that salt is added to damaged or inferior seed or feeding materials to hide their defects, and, again, the presence of salt may be the result of sea damage. Thirdly, it is well known that salt is hurtful to pigs, and if it be added to a food, without the purchaser being made aware of the fact of the salt being present, he may give it to his pigs, and suffer loss in consequence.

Guarantee on Invoice not agreeing with that on Circular.

Purchasers of fertilisers, &c., should be careful to see that the guarantees given to them on the invoices of their particular purchases agree with those set out on the circulars through seeing which they may have been induced to buy.

In a case which recently came under my notice, a manure had the following guaranteed analysis set out in a circular relating to it:—

GUARANTEED ANALYSIS.

2 % to 3 % ammonia, 8 % to 10 % (soluble) phosphates.

A purchase of three tons was made (at 3*l.* 10*s.* per ton), but the invoice described it as:—

ARTIFICIALLY COMPOUNDED MANURE.

Guaranteed Analysis.

Nitrogen.	Ammonia.	Sol. Phosphates.
1·25 % to 1·75 %.	Equal to 1·50 % to 2 %.	8 % to 12 %.

The guarantee in ammonia thus differed by a half per cent. between the circular and the invoice. The results of the analysis showed:—

Nitrogen	1·25 per cent.
Equal to Ammonia . .	1·51 "
Soluble Phosphates . .	7·34 "

so that, as regards ammonia, the guarantee on the invoice was just satisfied, but not that on the circular.

The purchaser drew attention to the discrepancy, and the manufacturers admitted the mistake, attributing it to an error of the printers. They made an allowance of 5*s.* 3*d.* per ton for the difference.

(Signed) J. A. VOELCKER.

July 25, 1899.

Botanical and Zoological.

Lord MORETON reported that the Committee had had under consideration the investigations made by the Consulting Botanist as to a disease affecting beech trees. It had been found that the primary cause of injury was due to the effects of lightning, and the Committee had made a recommendation to the Journal Committee as to the desirableness of publishing a note in the Journal on the susceptibility of different trees to injury from this cause. They also

suggested that a note should be published on the eradication of charlock.

The Consulting Botanist and the Zoologist had presented the following reports :—

REPORT OF CONSULTING BOTANIST.

Since May fifty inquiries from members of the Society have been attended to. Of these twenty-one have dealt with the purity and germination of seeds.

Information has been given as to the names and properties of weeds in pastures, some of which were innocuous, while others were injurious. Three species of *Ranunculus* were reported on. All the plants of this genus have a more or less acrid and irritating juice, and are consequently undesirable weeds in pastures. The most common species in our fields—*R. acris* Linn.—was believed by the member who forwarded it to have caused scouring in ewes and lambs; when these were removed from the field and replaced by some young horses they also began to scour. If any quantity of this weed was consumed it would fully account for the injury to these young animals. The somewhat coarse umbelliferous plant commonly called Cow-keep or Hog-weed (*Heracleum Sphondylium* Linn.) was supposed to be a dangerous weed in a pasture, but it was pointed out that it was freely eaten by all stock, and possesses no injurious qualities.

A serious fungoid outbreak in a plum orchard in Herefordshire was investigated. It had already killed several trees of the Victoria variety, and all the trees of this variety in the orchard had been attacked. The bark of the stems died in patches. The specimens of diseased stems forwarded for examination showed that the wood was full of the mycelium of a parasitic fungus, but there were no fruiting specimens present, and the attempt to induce the fragments sent to fruit was not successful, so that it was impossible to determine what was the fungus that was doing the injury. The extent and nature of the attack held out no hope of saving the trees attacked. Steps were suggested to prevent the injury spreading to other varieties in the orchard. The disease is known in other Herefordshire orchards, and deserves to be thoroughly investigated on the spot.

From several places beans were received, the leaves and stems of which were blackened by the attack of *Ascochyta Pisi* Lib. An improvement in the weather arrested the progress of the disease, and the crop was not seriously injured.

In the end of June a field of peas sown a fortnight previously was attacked by the fungus *Pythium Debaryanum* Hesse, a fungus which frequently destroys the seedlings of other plants besides the pea.

Damage to the Beech Trees at Belvoir Castle.

Shortly after the Council meeting at the end of May I visited Belvoir Castle to investigate the cause of the injury to the beech trees there. At the suggestion of the Hon. H. R. Scott, I called, on my way to the Castle, at Harlaxton Manor, where the injuries to the trees were of the same nature, but more extensive, than at Belvoir Castle.

At both places I found the trunks of many of the beeches covered to a large extent with a white woolly Aphis which had been supposed to have been the beginning of the fungoid attack that was destroying the trees.

The greater number of the injured trees presented the appearance of dead tracts of bark and wood from eight to twelve inches wide running for a long way down the stem of the tree. The bark had begun to crack and fall off. The wood exposed below was hard and dead, and cracked with numerous shallow fissures. It was not injured by fungi. Along the edges of the injured tract the uninjured bark and stem were developing a healthy and vigorous callus, which was gradually covering the dead wood and repairing the injury. This thickening callus assisted in pushing off the dead bark.

In the early stages of the injury water obtained access to the space between the dead bark and the wood. The water gradually found its way through cracks and small openings in the bark lower down the stem. In oozing slowly out, the water supplied food for the growth of Nostoc and other more minute Algæ, which formed dark patches on the bark. The injury to these trees was certainly not caused by any living organism, plant or animal; it must have had a physical origin. It seems to me to have been caused by lightning, the electricity as it passed down the stem having killed the active tissues between the bark and the wood along the tract it followed. The destruction of so large a portion of the active part of the trunk necessarily affected the vigour of the tree. But there is no reason why such trees should not maintain their life, and in time more or less recover from the injury.

A fewer number of trees were being destroyed by a parasitic fungus. The mycelium (or roots) of the fungus, having got possession of the wood, was penetrating it in every direction, and eating its substance away for the nourishment of the fungus. Two or three specimens of the fungus were observed which exhibited the beginnings of fructification. From these it was clear that the fungus was a Polyporus, most probably *P. fomentarius*, but the specimens were too young to permit the species being certainly determined.

When a wood-consuming fungus has produced outside the trees the mass on which the spores (or minute seeds) are borne, it has got such a hold of the tree that it is not possible to save the tree; the longer it is allowed to remain in the soil the worse it becomes and the more unfit for any economical use.

Great care must be taken to prevent the spreading of the evil. The fungus is spread through the forest by the agency of the spores, and these are produced only on the fungus growths which appear on the tree. These growths should be removed by the forester as soon as they are detected. The knife should be used to clean them thoroughly out, and the cut surface after being scraped should be painted over with tar. To prevent the scattering of the spores, the fungus after removal should not be left on the ground, or carried away in the hand or even in a basket, but a bag should be used, and the fungus itself should be carefully taken out of the bag and burnt. These excrescences, of whatever kind they are, and

on whatever tree they grow, should on no account be allowed to remain. They cannot be removed in too young a condition. To prevent injury to healthy trees all wounds, accidental or intentional, should be painted with tar. Pruning trees should be done in the late autumn or early winter, not only because the trees are then inactive, but because the application of tar to the pruned surface is much more efficient when there is no active flow of sap.

(Signed) WILLIAM CARRUTHERS.
July 25, 1899.

REPORT OF ZOOLOGIST.

Numerous applications have been dealt with by the Zoological Department since the last meeting of the Committee, most having reference to orchard pests.

Among the more strictly agricultural pests, first in importance is the occurrence of the Hessian fly in Norfolk, where it has destroyed patches in wheat and barley fields over a considerable area.

A curious case of failure in a pea crop, apparently due to the stem eel-worm (*Tylenchus devastatrix*) was reported from the South Coast. The crop followed oats, which are known to be subject to this pest, as well as the various members of the clover tribe. The remedy is the application of lime and the avoidance for a time of crops subject to attack.

Among the numerous fruit pests, the destructive pear midge seems to be steadily spreading, and is constantly occurring in new localities.

The minute fly lays its eggs in the opening blossom, and the maggots feed inside the young fruit, which is not prevented in setting, but is stunted in its growth, and remains quite small.

The attack is easily recognised, for the injured pears will be found to contain tiny white maggots which, when disturbed, place head and tail together and jump precisely like cheese maggots.

The maggots remain in the fruit for a considerable time, but eventually enter the ground to pupate.

If the attack is noticed it is highly important to deal with it at once, even at the sacrifice of all the fruit on the tree on which it is observed. Spraying is useless, but fallen fruit should be at once collected and destroyed, and where possible, a heavy dressing of kainit should be applied beneath the trees in the autumn.

Apple saw-fly, pear and cherry saw-fly, and currant and gooseberry saw-fly have been active in various quarters. A new pest to pear trees in this country, as far as I am aware, has appeared, though only to a trifling extent, in a small moth of the genus *Coleophora*. In appearance and habits it closely resembles a recognised American pest known as the cigar-case bearer, on account of the cigar-like case carried about by the small caterpillar. It attacks both the leaves and the young fruit. Attention was called to the case too late for proper investigation, but the locality will be kept under observation.

(Signed) CECIL WARBURTON.
July 25, 1899.

Veterinary.

Lt.-Colonel CURTIS-HAYWARD stated that various reports by Sir George Brown on the Veterinary Department at the Maidstone Meeting had been considered, and it had been decided that the whole question of the future Veterinary arrangements in the Society's showyards should be referred to a Sub-Committee, consisting of the Chairman of the Committee (Hon. Cecil T. Parker), the Honorary Director (Mr. Percy Crutchley), Lord Arthur Cecil, Sir Nigel Kingscote, Sir John Thorold, Sir Jacob Wilson, Sir George Brown, and Mr. A. J. Smith, with a request that they would report thereon at the next meeting of the Committee.

As the result of the recent examination at the Royal Veterinary College in Cattle Pathology, Mr. G. Lockwood, of Poulton-le-Fylde, had been awarded the first place, and Mr. H. S. Elphick, of 1, Brandling Park, Newcastle-on-Tyne, the second place. The Committee therefore recommended that the Society's Silver Medal be given to Mr. Lockwood and the bronze medal to Mr. Elphick. H.R.H. the President had personally expressed the opinion in the Highland and Agricultural Society's Showyard at Edinburgh that it would be an advantage for a number of zebra hybrids, bred by Professor Cossar Ewart—which had been on exhibition there, and had attracted a large amount of public attention—to be exhibited at York next year, and the Committee recommended that the necessary arrangements be made for the purpose.

Professor McFadyean had presented the following report:—

ANTHRAX.—The outbreaks reported during the first twenty-seven weeks of this year number 296 with 579 animals attacked, as against 331 outbreaks and 505 animals attacked during the same period of 1898.

GLANDERS.—The figures for the first twenty-seven weeks of this year show a sensible decline in the prevalence of the disease as compared with 1898, the outbreaks numbering 370 with 627 animals attacked, as against 408 outbreaks and 753 animals attacked during the same period of 1898.

SWINE FEVER.—The total outbreaks for the first twenty-seven weeks of this year are 47 in excess of those for the corresponding period of last year, the figures being 1,566 and 1,519 respectively.

RABIES.—Only one case of this disease has

been detected during the current year. At the same date in 1898 fourteen cases had been reported.

MISCELLANEOUS.—The number of specimens forwarded to the Research Laboratory at the Royal Veterinary College for examination during the past month was twenty-nine. These comprised cases of tuberculosis, glanders, suspected rabies, anthrax, red-water, tumours, parasitic lesions, etc.

The Committee appointed by the Council to carry out experiments bearing on the reliability of the tuberculin test have held three meetings at the Royal Veterinary College, where the experiments have been in progress since June 13.

Stock Prizes.

Mr. BOWEN-JONES reported that the Committee had considered two further cases of animals appearing in the judging-ring with the wrong numbers affixed, and they recommended the alteration of the official awards of prizes as follows:—

The second prize of 10*l.* in Class 53, for Clylesdale mare with foal at foot, to the Marquis of Londonderry for "Essence," No. 360, which appeared in the judging-ring with the number belonging to his Lordship's mare "Necklet," No. 361.

The second prize of 10*l.* in Class 126, for Guernsey cow or heifer in-milk or in-calf, to Mrs. Montefiore for 'Claremont Flora" No. 1021, which appeared in the judging-ring with the number belonging to Mrs. Montefiore's cow "Silvester," No. 1022.

The Committee had considered various suggestions and recommendations for the York prize-sheet of 1900, and had appointed a Sub-Committee, consisting of the Chairman (Mr. Sanday), Lord Arthur Cecil, the Hon. Cecil Parker, Sir Jacob Wilson, the Honorary Director (Mr. Crutchley), Mr. Garrett Taylor, and the Stewards of Stock at Maidstone (Mr. A. J. Smith, Mr. S. P. Foster, Mr. J. P. Terry, and Mr. Frederick Reynard), to further consider the suggestions, prepare a schedule of prizes in connection with the York Meeting, and to report at the meeting of the Committee on October 31.

Implement.

Mr. FRANKISH (Chairman) formally reported the results of the trials of implements at the Maidstone Meeting, and announced that the Committee would bring up at their next meeting suggested regulations for the trials of sheep-shearing machines and mechanical milking machines, for which the Society had decided to offer prizes at the York Meeting next year. The Committee had considered the reference made to them by the Journal Committee as to the publication in the Proceedings of a memorandum on the subject of the close dressing of barley, and had recommended the publication of such memorandum as below:—

Close Dressing of Malting Barley.

The attention of the public has recently been directed by an article in the Society's Journal, and a subsequent discussion in the Press, to the disadvantages from a malting point of view of dressing barley too closely in threshing machines. It is stated by experienced maltsters that barley when badly threshed suffers deterioration to the extent of 5*s.* a quarter, and it is estimated that enormous sums of money are thus lost to the farmer.

Under these circumstances, the attention of members of the Society is particularly directed to what the Council are informed are the views of the leading maltsters on this subject. The injury is not limited to those corns which are cut (*i.e.*, cut in half). Close-snipped corns (*i.e.* from which too much has been removed from one or both extremities) are equally and perhaps more objectionable, as also are other corns that have been peeled or bruised.

It is inferred that a corn is not cut or damaged so long as it will grow; but a damaged corn may grow perfectly and yet be most objectionable, as it will mould on the floor. The husk of those corns which are injured in threshing steep more quickly than the others, and the growth does not maintain that uniformity after the process of steeping which is essential to the production of good malt.

The Committee accordingly recommend members to examine carefully the machine they propose to use before the threshing season commences, in order to see that neither the drum nor concave is worn in the centre. If they are worn, the drum will have to be set too close, and the grain will either be damaged at the sides or will escape unthreshed. Great attention should be paid to regularity of feeding. The engine should be driven at an even speed, and proper care should be taken in the adjustment of the several parts of the machine. Moreover, if a good sample of barley is desired, an undue quantity should not be passed through the machine in one day.

General York Committee.

Mr. REYNARD reported the constitution of a General York Committee to consist of the whole Council, together with the following representatives of the Local Committee:—The Lord Mayor of York (Mr. Alderman Border), the Sheriff of York (Mr. J. J. Hunt), Mr. Alderman Foster, Mr.

Alderman McKay, Mr. Alderman Rymer, Mr. F. E. Walker, Mr. G. A. Eason Wilkinson, and Mr. W. H. Andrew (Town Clerk). The Committee recommended that the dates of the Country Meeting to be held next year at York should be fixed for Monday, June 18, to Friday, June 22, inclusive, the Implement Yard only being open on the preceding Saturday, June 16, and that the prices of admission should be as usual. The Committee recommended that the following prizes for Cider and Perry be offered at the York Meeting:—

Cask of Cider not less than 18 and not more than 30 gallons made in autumn of 1899—First prize 5*l.*, second prize 3*l.*, third prize 2*l.*

One Dozen Cider made in autumn of 1899—First prize 5*l.*, second prize 3*l.*, third prize 2*l.*

One Dozen Cider made in any year before 1899—First prize 5*l.*, second prize 3*l.*, third prize, 2*l.*

One Dozen Perry—First prize 5*l.*, second prize 3*l.*, third prize 2*l.*

The Lord Mayor of York had announced that the Local Committee would submit their proposals for local prizes at the next meeting of the Council, and that a sum of at least 1,500*l.* would be available for such prizes.

Showyard Works.

Sir JACOB WILSON (Chairman) reported that the entrances, pavilions, and nearly the whole of the shedding in the Maidstone showyard were now pulled down, and the permanent plant would soon be removed to York. The first two sales of timber had been held, and had realised fairly satisfactory prices. The next sales of timber would take place on July 27 and 28, and further sales on August 10, 11, 21, and 22. As regards the delivery of letters to members at the members' pavilion in the showyard at York, the Secretary was in communication with the Post Office authorities. The Committee had discussed and settled various matters in connection with the York meeting.

Sir JACOB WILSON, in presenting this report, said he thought it only right to mention to the Council that in the opinion of the Showyard Works Committee the special and very hearty thanks of the Society were due to Mr. Cornwallis for his valuable services as Steward of Forage at the Maidstone Meeting. (Hear, hear.)

Selection.

Sir JOHN THOROLD (Chairman) presented the recommendations of the Committee as to the nomination of a new member of Council in the room of Sir Jacob Wilson, appointed a Vice-President, and as to the dates of the Council Meetings in 1900.

Education.

Lord MORETON (Chairman) reported that various accounts connected with the Society's examination had been passed, and had been referred to the Finance Committee for payment. Arrangements had been made for the forthcoming examination in Dairying, to be held at Reading next September; and the Committee recommended that a further meeting of the Joint Board for the examination for the proposed National Diploma in Agriculture be convened for some day in the week of the Dairy Show next October to consider various points connected with the syllabus.

Dairy.

Mr. J. MARSHALL DUGDALE (Chairman) reported that various accounts had been passed for payment in connection with the Dairy at the Maidstone Meeting. The Committee had considered the question of the Demonstrations of Poultry Dressing at the Society's country meetings, and in view of the small attendance at the lectures in the showyard, they recommended that demonstrations of this nature should not be continued at York.

Country Meeting of 1901.

The SECRETARY laid upon the table further correspondence with the Corporation of Cardiff, and said that it would be within the recollection of the Council that, at their monthly meeting held in London on May 31, when the Society was threatened with an injunction in the event of

any encroachments being made on the Llandaff Fields (the site selected for the Show of 1901), the Council had written to the Corporation of Cardiff expressing their hope that the Corporation would be able by July 26 "to give the Society satisfactory assurances that the conditions under which the Council accepted the invitation to visit Cardiff in 1901 can and will be fulfilled." At the meeting held in the Maidstone Showyard on June 21 last, Mr. Crutchley reported that "Mr. Sanday and himself had that morning (June 21) received a deputation from Cardiff, to consider the objections which had been raised locally to the enclosing of a portion of the Llandaff Fields for the purposes of the Society's country meeting of 1901. The proposals made by Mr. Sanday and himself had been assented to by the Mayor, subject to formal ratification, and it was hoped that a definite answer would be forthcoming by the next meeting of the Council on July 26." The following letter from the Town Clerk of Cardiff, dated July 25, had been received that morning:—

"Town Hall, Cardiff,
[Copy.] "July 25, 1899.

"COUNTRY MEETING, 1901.

"Dear Sir Ernest,—In accordance with the promise contained in my letter of the 17th inst., I have to write you as the result of the public meeting of the inhabitants held last evening.

"The following proposition was made by the Mayor:—

"'That this meeting has heard with delight that the Royal Agricultural Society was prepared to hold its meeting in Cardiff in the year 1901, and hereby endorses the action of the Corporation in offering to the Society the use of a part of the Llandaff Fields for the purpose of the Show, believing that the visit of such a great and important Society to Cardiff will be of immense benefit to the town and district.'

"This motion was heartily supported by members of the Corporation and other gentlemen, but, after some discussion, the following amendment was proposed and seconded:—

"'That this meeting, while desiring that the Royal Agricultural Society's Show should be held in Cardiff in the year 1901, absolutely disapproves of the Llandaff Fields, or any part of them, being used for the purpose of that or any other show.'

"This amendment, I am extremely sorry to say, was carried by a large majority of about two to one.

"It will be my duty to place this matter before the next meeting of my Committee, after which, no doubt, a further communication will be sent to you.

"Yours faithfully,
"(Signed) J. L. WHEATLEY, Town Clerk.
"Sir Ernest Clarke,
"13, Hanover Square, London."

Mr. STRATTON said that he was extremely sorry, as a resident in the neighbourhood of Cardiff, that this difficulty had arisen, and that the negotiations had, so far, fallen through. He still hoped, however, that some other site would be found, though he was not authorised by anyone to say that there was another site which would be available. If the Mayor and Corporation were really in earnest with respect to the Society visiting Cardiff in 1901, the existing difficulty would, no doubt, be eventually got over.

Mr. CRUTCHLEY pointed out that so far as the Society was concerned the matter could not be raised again by the Council; whatever initiative was taken would have to come from the Corporation of Cardiff. The Society had accepted a certain site, but negotiations as to this had now fallen through, and it rested with the Cardiff authorities if they wished to continue the negotiations to offer the Society an alternative site.

Sir WALTER GILBEY said that as the Town Clerk referred in his letter to a further communication from himself after consideration of the situation by his Committee, the Council would doubtless desire to give such Committee the opportunity of stating what they were prepared to suggest. He thought that if the matter were left during the recess in the hands of the members of Council who had already conducted the negotiations with Cardiff on behalf of the Society, and who were familiar with the whole circumstances, the Council might have at their next meeting on November 1, materials for coming to a final conclusion in the matter. He would therefore move that the further consideration of the question be postponed until the November meeting of the Council, power being given to Messrs. Crutchley and Sanday —who had formed the Committee of Inspection—to act meanwhile in the matter of the Cardiff invitation as

they might think desirable in the interests of the Society.

Mr. STRATTON seconded the motion.

The CHAIRMAN said he felt sure the Council would regret that a new difficulty should have arisen between the Society and the Mayor and Corporation of Cardiff, but he believed the proposal made by Sir Walter Gilbey would meet with the general approval of the Council. There was no immediate hurry, and he thought that they would in November be in a better position to hear and determine as to what course they should pursue with respect to the country meeting of 1901.

The resolution was then put and carried unanimously.

Miscellaneous.

On the motion of Earl EGERTON OF TATTON, seconded by Sir JOHN THOROLD, authority was given to affix the Society's seal to (1) a power of attorney for the sale of Consols; (2) two new certificates of Harewood House Debenture Stock; (3) the diplomas of the two new Honorary Members elected on June 21 last (the Marquis de Vogüé and Herr Von Arnim).

Dates of Future Meetings.

The date of the General Meeting in December next was fixed for Thursday, December 7, 1899, the Thursday in the Smithfield Show week.

The dates of the Meetings of Council during 1900 were settled as follows:—February 7, March 7, April 4, May 2, May 30, June 20 (in the York Showyard), August 1, November 7, and December 12, 1900.

The Council then adjourned over the autumn recess until Wednesday, November 1, 1899, at 12 noon.

Proceedings at General Meeting of Governors and Members,

HELD IN THE LARGE TENT IN THE SHOWYARD AT

THE MAIDSTONE MEETING.

TUESDAY, JUNE 20, 1899.

THE EARL OF COVENTRY (PRESIDENT) IN THE CHAIR.

Present on the Platform:

Trustees.—H.R.H. the Prince of Wales, K.G., Sir Walter Gilbey, Bart., Colonel Sir Nigel Kingscote, K.C.B., the Duke of Richmond and Gordon, K.G., Earl Spencer, K.G., Sir John Thorold, Bart.

Vice-Presidents.—Mr H. Chandos-Pole-Gell, the Earl of Feversham, Mr. Charles Whitehead.

Other Members of Council.—Mr. J. H. Arkwright, Mr. Alfred Ashworth, Mr. R. C. Assheton, Mr. George Blake, Mr. J. Bowen-Jones, Mr. Victor C. W. Cavendish, M.P., Mr. F. S. W. Cornwallis, M.P., Mr. Percy Crutchley, Lieut.-Colonel J. F. Curtis-Hayward, the Earl of Derby, K.G., Mr. S. P. Foster, Mr. James Hornsby, the Earl of Jersey, G.C.M.G., Captain W. S. B. Levett, Mr. C. S. Mainwaring, Mr. Henry D. Marshall, Mr. Joseph Martin, Mr. T. H. Miller, Mr. P. A. Muntz, M.P., the Hon. Cecil T. Parker, Mr. A. E. Pease, M.P., Mr. Albert Pell, Mr. J. E. Ransome, Mr. F. Reynard, Mr. C. C. Rogers, Mr. Howard P. Ryland, Mr. G. H. Sanday, Mr. A. J. Smith, Mr. E. W. Stanyforth, Mr. J. P. Terry.

Governors.—The Earl of Portsmouth, Lord Burton, Lord Middleton, Mr. C. R. Moorsom M. Maude.

Honorary Members.—The Marquis de Vogüé, Herr von Arnim, Professor Sir George Brown, C.B.

Officers.—Sir Ernest Clarke (Secretary), Dr. Fream (Editor of the Journal), Dr. J. Augustus Voelcker (Consulting Chemist).

Prince Serge Galitzin, the Lord-Lieutenant of Kent (Earl Stanhope), the High Sheriff of Kent (Mr. J. A. Friend), the Mayor of Maidstone (Mr. Wm. Morling), the Vicomte de Chazelles, Sir Marcus Samuel, Mr. R. A. Hamilton Seymour (Hon. Secretary of the Local Committee), and others were also on the platform; and there was a crowded attendance of the general body of Members in the tent.

Vote of Thanks to the Mayor and Corporation of Maidstone.

The President, having opened the proceedings, called on Sir NIGEL KINGSCOTE (Trustee) to move the first resolution, "That the best thanks of the Society are due, and are hereby tendered, to the Mayor and Corporation of Maidstone, for their cordial reception of the Society." Sir Nigel said that the Royal Agricultural Society had received a right royal welcome from the Borough of Maidstone, and they had only to pass through the streets of the town and

notice the decorations to see how everybody had vied one with the other to give the Society a hearty reception. From the first moment that the idea was mooted of the Society holding its Show in Kent, the late Mayor and the present Mayor, as well as the inhabitants of Maidstone generally, had done their very best to encourage the Society to come to their town. They all knew, and he thought he might allude to them, the difficulties and sad calamities which prevented the Society coming in the year that had been originally fixed, and he was sure that everybody must view with great admiration the way in which all those connected with the town had striven to overcome those difficulties. Now that the Society had come, their very cordial thanks were due to the Mayor and Corporation for all that they had done, as well as to the owner of the land, Sir Marcus Samuel, for one of the most picturesque sites that their Show had ever occupied.

Mr. Bowen-Jones (Senior Steward of Implements) said it afforded him sincere satisfaction to second the resolution. He had had a great deal of experience as steward at the Royal Shows in various capacities during the last sixteen years, and never in his memory had they met with a more cordial reception than had been given to them by the inhabitants of Maidstone.

The motion having been carried unanimously,

The Mayor of Maidstone (Mr. William Morling) said it was very pleasant indeed to hear such a high opinion of the manner in which the Royal Agricultural Society had been welcomed to their town. Maidstone had in fact risen to the occasion, and had done its very best to produce the most suitable response that they could show to the favour which the Society had done them by paying them a visit. They had done their utmost, and he was glad to hear that although the attendance could not perhaps equal that of some of the Society's larger Shows, yet that the Show of this year was considered a great success, in the excellence of the exhibits and the beauty of the site.

Vote of Thanks to Maidstone Local Committee.

Earl Spencer, K.G. (Chairman of the General Maidstone Committee), said that he had the honour to move the next resolution, which was, "That the best thanks of the Society be given to the Maidstone Local Committee for their exertions to promote the success of the Meeting." They who had had experience in the practical working of these great agricultural gatherings knew full well how many factors went towards making a successful Meeting. There was the weather, there were the railway arrangements, there was the administration in Hanover Square, and, lastly, there were the people who passed through the turnstiles. But one of the most important factors of all, in that long series of preparations before the Meeting, was the careful and thoughtful planning of the local arrangements. The present successful Show was the result of a victorious struggle against obstacles which had been overcome by means of the active support of the Local Committee and its energetic Secretaries. On that occasion the Council had to thank their local colleagues extremely for the ability with which they had supported the officers of the Society. He could not but refer to the difference between this Agricultural gathering and the assembly which took place on that very spot a hundred years ago. In 1799 there were gathered together in Mote Park numerous bands of Yeomanry, composed of the flower of the agricultural population, who had responded to the call to resist a hostile demonstration from across the sea. To-day they were very heartily welcoming a large number of friends from abroad. They did not meet this peaceful invasion with resistance, but welcomed it from the bottom of their hearts. (Loud cheers.)

Mr. Percy Crutchley (Honorary Director) having seconded the Resolution,

Earl Stanhope (President of the Local Committee) begged to be allowed, on behalf of the Members of the Local Committee, to express their grateful appreciation of the vote of

thanks which had just been passed. It was highly satisfactory to know that the necessary local arrangements had been adequately carried out, and he should like to add his tribute to that of the Mayor, by saying that it was a fortunate circumstance that they had on the Local Committee two gentlemen who were on the Council of the "Royal," viz. Mr. Cornwallis, their popular member, and Mr. Whitehead. He felt that the carrying out of the arrangements had depended very much on these two gentlemen, while at the same time they were greatly indebted to the Honorary Secretary, Mr. R. A. Hamilton Seymour. Mention had been made of the many anxious moments occasioned by the necessity of providing an adequate supply of water for each day of the Show; but this and many other difficulties had been surmounted. It would have been a great disappointment to the county, and to Maidstone, if the Show had been put off for a second time. Before sitting down, he might perhaps be permitted to say how very gratified they were at the presence of His Royal Highness the Prince of Wales amongst them on that day.

Suggestions of Members.

In reply to the usual inquiry from the Chair as to whether any Governor or Member had any question to ask or suggestion to offer that might be referred to the Council for consideration,

Mr. SAMUEL KIDNER said that a question had been brought up at the meeting of the National Sheep Breeders' Association relative to the delivery of members' letters in the Showyard. A good many members had made complaints that they had to go to a certain pigeon-hole at the entrances, and that they had had much difficulty in getting their letters. He had to ask, on behalf of the National Sheep Breeders' Association, that the Council would arrange for the letters of members to be made available for them at some more central office than at the entrances.

The Hon. and Rev. A. BAILLIE-HAMILTON said he had been requested by many breeders of Channel Islands cattle to bring to the notice of the Council a little incident in which he himself had been unwittingly the chief offender. As a judge of Channel Islands cattle, he had in previous years obtained permission from the Honorary Director for the animals to be milked in the judging ring; but on the previous day he had been brought to task for doing so. He at once told the men to discontinue the milking, but he had to resort to the expedient of milking the cattle himself on the ground before he could come to a just conclusion concerning the relative value of the animals. Those acquainted with the Channel Islands breeds knew that there was a great difference between the milk vessels of those breeds, and that it was impossible to give satisfaction unless they were allowed to milk the animals to a certain extent. His purpose in rising was to ask the Council so to frame their regulations that other judges might not fall unwittingly into the same error as he had done. He would respectfully ask that the judges of the Channel Islands breeds might be allowed, when they thought it necessary, to have the cows in these classes milked for the purposes of judging. Considering the vast number of Channel Islands cattle exhibited at all their Shows, it was important that the judges should be able to carry out their work in a business-like manner and exercise their discretion, with the sanction of the great "Royal" Society of England.

The PRESIDENT stated that the points which had been raised by Mr. Kidner and Mr. Baillie-Hamilton would receive the consideration of the Council.

Vote of Thanks to the President.

The Earl of PORTSMOUTH said that a very agreeable task had been imposed upon him, viz. that of moving a most hearty vote of thanks to the Earl of Coventry for his services during the past year. He did not feel that any words of his were at all necessary to obtain for his proposition

the most cordial support of the members. As Master of Her Majesty's Buckhounds, as the holder of a responsible and somewhat invidious position in the control of a great race meeting, as an eminent breeder of stock, and as a large landowner and country gentleman, his noble friend had played many parts, and played them all with credit. He played them with credit to himself, with credit to their Society, and with credit to the great interest with which the Society was so largely bound up and associated.

Mr. GEORGE DICKSON, in seconding the motion, referred to the President as the true friend of all farmers, whose presence at their Shows was always looked forward to with great pleasure.

The SECRETARY then put the motion, which was carried unanimously.

The PRESIDENT, in reply, said he was very grateful to them for the cordial manner in which they had received the resolution proposed in such kind terms by his noble friend, Lord Portsmouth. He could assure them that it had been a pride and a pleasure to him to occupy the chair as President during the last year, and if he had done anything which would conduce in any way to the advantage of the Society, or to the good of Agriculture, he should be amply rewarded. He hoped that the Show which had just been inaugurated would continue to be a success to the end. They did not expect a very large attendance, but they could not have a better ground than had been chosen, and in the midst of these beautiful surroundings the Society found itself quite at home. Before sitting down he would like to allude to one special feature of the Show, viz. the presence of distinguished foreigners representing agricultural societies abroad, who had come over to be present that day He felt sure that in the name of their great Society he might give their foreign friends a very cordial welcome and at the same time express the hope that they might derive enjoyment from their visit, and come again on many future occasions. (Cheers.) He thanked the members of the Society for their hearty support during his year of office, and especially Mr. Percy Crutchley, the Honorary Director, Sir Ernest Clarke, their Secretary, and the whole of the Society's staff for the loyal support and assistance they had given to him whilst he had occupied the Chair.

Presidency for 1899–1900.

The PRESIDENT said he had now to fulfil a very agreeable duty in moving "that H.R.H. the Prince of Wales be requested to take the Chair after the conclusion of the Maidstone Meeting." (Loud cheers.) He was quite sure that they would all support this resolution most enthusiastically. Their Royal Family had always given the greatest support and encouragement to Agriculture, and particularly during the last few years, when that support and encouragement had been so greatly needed. They all knew that Agriculture had been assailed in many quarters, and that it had been suffering from a very deep depression. He trusted that there was now a rift in the clouds, but whether that were so or not, during all this bad time Agriculture had always received the support and encouragement of the Royal Family, for which they were heartily grateful. His Royal Highness was an active member of the Society. He had already filled the Presidential chair three times, and it was very gratifying that at the great meeting which they expected to hold

next year His Royal Highness would again be President. He could not express how much they were indebted to him for again accepting the Presidency, and he felt that His Royal Highness would receive in the great county of York such a hearty welcome as had never been accorded to any President before. (Cheers.)

The Earl of DERBY said he had been asked to second the motion, but it was a duty which hardly required performance, as the motion had already been accepted by the whole meeting with unanimity. They knew how many great and arduous duties His Royal Highness was called upon to perform, and how well he discharged them. In view of those duties, they might well think that he would hardly have time to devote to the Society. Still, they knew by experience of the past that His Royal Highness was on all occasions ready to be present wherever business or other engagements called him, and to take part in the work of the Society, like the very humblest and youngest member of it. Indeed, if he might respectfully say so in his presence, he thought that His Royal Highness, more nearly than anyone else, was able to realise the difficult problem of being in different places at the same time. They hailed with delight the Prince's succession to the Presidential Chair, however sorry they might be to part with his noble friend who was about to vacate it. (Cheers.)

The motion was then put from the Chair, and carried by acclamation, all the Members standing.

The PRINCE of WALES, on rising to reply, was received with prolonged applause. His Royal Highness spoke as follows: I am most grateful to my noble friends, Lord Coventry and Lord Derby, for the kind manner in which they have put this resolution before you, and to the Meeting generally for the hearty way in which you have all received it. It was with the greatest satisfaction that I accepted the post of President of our great National Society, when a wish was expressed that I should be at its head in connection with the Meeting to be held in the year 1900. As you all know, I take a deep personal interest in the welfare of the Society, and it is now a very long time since I first became intimately associated with it. It is just thirty years ago since I was President of the Society for the first time, when the Show was held at Manchester. That Show was the largest and most successful which had ever been held up to that time, and it is not a little curious that at intervals of exactly ten years since, I have been intimately associated with the management of the Society. In 1879, we had our great Show at Kilburn, when we had many foreign visitors. In 1889 we had the magnificent exhibition at Windsor, under the Presidency of Her Majesty the Queen—(cheers)—when also we were able to welcome a large number of our foreign friends; and now, again, after another ten years, we are happy to see amongst us so many representatives of Continental agriculture.

The two national Societies of France and Germany, which correspond in their respective countries to the Royal Agricultural Society of England, have honoured us by sending influential deputations from their executive to visit the Show, and we are happy to welcome on the platform, as the representative of France, M. le Marquis de Vogüé, the President of the Société des Agriculteurs de France, which was founded in 1868 on the model of our Society, and which is a very large and flourishing body. We are also happy

to welcome Herr von Arnim, the Chairman of the Directorate of the National Agricultural Society of Germany. This Society, which was formed so recently as 1884, also on our model, has already exceeded us in the number of its members. We have many points in common with both these Societies, and I am sure that it will be your wish that we should reciprocate in some way the compliment they have paid us by sending so many distinguished representatives to attend the Maidstone Meeting. The Council have decided, therefore, to ask the Marquis de Vogüé, as representing France, and Herr von Arnim, as representing Germany, to accept the compliment of Honorary Membership of the Society, and have requested me to be the medium of presenting to these two distinguished agriculturists their badges of Honorary Membership, which I have now the pleasure of doing. (Loud cheers.)

In thanking you for the compliment which you have paid to me by electing me for the fourth time as your President, I can only express the hope that we may be favoured for our meeting at York with fine weather; and, though we cannot hope to have so charmingly picturesque a Showyard as we have at Maidstone, yet we may hope that in other respects it may be equally satisfactory and equally agreeable. (Cheers.)

New Honorary Members.

His Royal Highness then handed to the Marquis de Vogüé and to Herr von Arnim their badges of Honorary Membership, amidst loud applause from all parts of the tent.

The Marquis DE VOGÜÉ, speaking in English, said he would venture to borrow their own language in attempting to express to those present the great gratitude he felt for the compliment paid to him. The fact that that honour had been conveyed to him by the hands of His Royal Highness increased it to such a degree that it was quite impossible to find terms to adequately express his sentiments. Their French Agricultural Society, as had been said, was formed upon the model of the English Society. They endeavoured to follow its example, and were happy to do their best for the progress of agriculture, being persuaded that the progress of agriculture was the progress of humanity, and that it was the best way of furthering the unity of countries and nations. (Cheers.)

Herr VON ARNIM, also speaking in English, thanked His Royal Highness and the Royal Agricultural Society for the Honorary Membership conferred upon him, and for the cordial manner in which he and his colleagues of the Deutsche Landwirtschafts-Gesellschaft had been welcomed at the Show. The German Agricultural Society was a younger sister of the Royal Agricultural Society of England, and they had come there to learn and to take advantage of that great Show. German agriculture suffered from the same cause which had affected English agriculture, namely, the difficulty of combating foreign competition, but they hoped by carrying out the principles of science with practice, to be able to do this successfully. When he looked round that Show he saw by the exhibits that the English Society had not been unsuccessful in this combat. He hoped that the work of the Royal Agricultural Society would continue to flourish, and that English husbandry and English agriculture would regain their former prosperity. (Cheers.)

The proceedings then terminated.

MAIDSTONE MEETING.

JUNE 17 TO 23, 1899.

PRESIDENT:

THE EARL OF COVENTRY,
Croome Court, Severn Stoke, Worcester.

OFFICIALS:

Honorary Director.
PERCY CRUTCHLEY, Sunninghill Lodge, Ascot.

Stewards of Live Stock.
ALFRED J. SMITH, Rendlesham, Woodbridge, Suffolk.
S. P. FOSTER, Killhow, Carlisle.
J. P. TERRY, Berry Field, Aylesbury, Bucks.
FREDERICK REYNARD, Sunderlandwick, Driffield, Yorks.

Stewards of Implements.
J. BOWEN-JONES, Beckbury, Shrewsbury.
G. H. SANDAY, Highfield House, Uxbridge.
HOWARD P. RYLAND, Moxhull Park, Erdington, near Birmingham.

Steward of Dairying.
E. VINCENT V. WHEELER, Newnham Court, Tenbury, Worcestershire

Steward of Forage.
F. S. W. CORNWALLIS, M.P., Linton Park, Maidstone, Kent.

Stewards of Finance.
W. FRANKISH, Limber, near Brocklesby, Lincolnshire.
J. MARSHALL DUGDALE, Llwyn, Llanfyllin, *viâ* Oswestry.

Secretary.
Sir ERNEST CLARKE, 13 Hanover Square, London, W.

Assistant Director.
J. E. COMPTON-BRACEBRIDGE.

Supt. of the Showyard
ROBERT S. BURGESS

JUDGES OF IMPLEMENTS.

Machines for Washing Hops.—Class I.
WILLIAM CHAMBERS, Manor House, Southfleet, Gravesend.
MONTAGU C. H. TAYLOR, Shelsley Walsh, Worcester.

Cream Separators.—Classes II. and III.
DOUGLAS GILCHRIST, The College, Reading.
R. M. GREAVES, Wern, Portmadoc, N. Wales.

Packages for the Carriage of Fruit.—Classes V. and VI
WILLIAM CHAMBERS, Manor House, Southfleet, Gravesend.
FREDERICK FISHER, 12 Botolph Lane, London, E.C.
MONTAGU C. H. TAYLOR, Shelsley Walsh, Worcester.

Miscellaneous Implements entered for Silver Medals.
CHARLES P. HALL, Park Farm, Woburn, Bedfordshire.
BAYNTUN HIPPISLEY, Ston Easton Park, Bath.

JUDGES OF STOCK, &c.

(As finally corrected.)

HORSES.

Hunters.—*Classes* 1, 3, 5, 6, & 7.

JOHN COOPER, Brook Hill, East Haddon, Northampton.
Hon. ALEXIS ROCHE, Old Court, Doneraile.

Hunters.—*Classes* 2, 4, & 8–11.

HENRY BODEN, The Friary, Derby.
Hon. ALEX. E. PARKER, Deeside, Bangor Isycoed, Wrexham.

Cleveland Bays and Coach Horses.
Classes 12–15.

GEORGE BURTON, Thorpe Willoughby, near Selby, Yorks.
GEORGE SCOBY, Beadlam Grange, Nawton, Yorks.

Hackneys.—*Classes* 16–23.

JOSEPH MORTON, Stow, Downham Market, Norfolk.
T. D. REED, Beeford Grange, Hull.

Ponies, Harness Horses and Ponies.
Classes 24–27 & 40–42.

EDWARD MUCKLOW, jun., Wood Hill, Bury, Lancashire.
ROMER WILLIAMS, Norfolk House, Thames Embankment, W.C.

Shetland, Mountain and Moorland, and Polo Ponies.—*Classes* 28–39.

JONATHAN P. BAIRD, Castlemains, Douglas, Lanarkshire, N.B.
Earl of HARRINGTON, Elvaston Castle, Derby.

Shires and Agricultural.
Classes 43–49, 63 & 64.

A. H. CLARK, Moulton Eaugate, Spalding.
JOHN NIX, Stud Farm, Alfreton.

Clydesdales.—*Classes* 50–56.

DAVID BUCHANAN, Garscadden Mains, N.B.
JOHN M. MARTIN, 32 Ann Street, Edinburgh.

Suffolks.—*Classes* 57–62.

HERMAN BIDDELL, Playford, Ipswich.
W. H. HEWITT, West Hill, Copdock, Ipswich.

CATTLE.

Shorthorns.—*Classes* 65–71.

T. H. HUTCHINSON, Manor House, Catterick, Yorks.
JOSEPH STRATTON, Wick Down, Swindon, Wiltshire.

Herefords.—*Classes* 72–78.

G. H. GREEN, Wigmore Grange, Leintwardine, R.S.O., Hereford.
J. H. YEOMANS, Stretton House, Hereford.

Devons.—*Classes* 79–84.

W. S. PERRY, Crelake, Tavistock, Devon.
F. W. SHUKER, Scorrier, Cornwall.

Sussex.—*Classes* 85–91.

ALFRED HEASMAN, Court Wick, Littlehampton.
DANIEL SWAFFER, Bond Farm, Kingsnorth, near Ashford.

Longhorns.—*Classes* 92 & 93.

G. H. GREEN, Wigmore Grange, Leintwardine, R.S.O., Hereford.
W. W. SWINNERTON, Stivichall Grange, Coventry.

Welsh.—*Classes* 94–98.

EVAN EVANS, Maesmynach, Llanybyther, Carmarthen.
WILLIAM JONES, Llyngwyn, Chwilog, R.S.O., Carnarvon.

Red Polled and Aberdeen Angus.

Classes 99–108.

D. F. SMITH, Steward's Office, Easton Park, Wickham Market.
WILLIAM WHYTE, Spott, Kirriemuir, N.B.

Galloways and Ayrshires.

Classes 109–118.

THOMAS KERR, Kirkchrist, Kirkcudbright, N.B.
WILLIAM PARKIN-MOORE, Whitehall, Mealsgate, *viâ* Carlisle.

Jerseys.—*Classes* 119–123.

J. F. HALL, Sharcombe, Wells, Somersetshire.
F. C. STARKIE, Oakwood, Otterbourne, Winchester.

Guernseys.—*Classes* 124–128.

CHARLES A. BARNES, Solesbridge, Rickmansworth.
Hon. and Rev. ARTHUR BAILLIE-HAMILTON, Les Quartiers, Guernsey.

Kerries and Dexters.
Classes 129–132.

LUKE CHRISTY, Carrigeen, Croom, co. Limerick.
Major LIONEL HEWSON, Direen, Kenmare, co. Kerry.

SHEEP.

Leicesters.—*Classes* 136–140.

DAVID LINTON, Low Street Brewery, Bedale, Yorks.
W. H. TREMAINE, Sherborne, Northleach, Glos.

Cotswolds.—*Classes* 141–145.

ROBERT JACOBS, Eynsham, Oxfordshire.
THOMAS THORNTON, Cavenham House, Wereham, Stoke Ferry.

Lincolns and Devon Long-wools.
Classes 146–151, 189 *&* 190.

HENRY GOODYEAR, Austerby, Bourne, Lincolnshire.
C. W. TINDALL, Wainfleet, Lincolnshire.

Oxford Downs.—*Classes* 152–156.

GEORGE ADAMS, Wadley House, Faringdon, Berkshire.
JOHN BRYAN, Southleigh, Witney, Oxon.

Shropshires. (Rams.)
Classes 157–159.

JOSEPH BEACH, The Hattons, Wolverhampton.
HARRY WILLIAMS, Newton-on-the-Hill, Shrewsbury.

Shropshires. (Ewes.)
Classes 160 *&* 161.

A. S. BERRY, Pheasey Farm, Great Barr, Birmingham.
P. A. EVANS, Sherlowe, Wellington, Shropshire.

Southdowns.—*Classes* 162–167.

HUGH PENFOLD, Selsey, Chichester.
RICHARD RELFE VERRALL, Falmer, Lewes, Sussex.

Hampshire Downs.—*Classes* 168–172.

J. CARPENTER, Manor House, Burcombe, Salisbury.
T. A. EDNEY HAYTER, The Mount, Whitchurch, Hants.

Suffolks.—*Classes* 173–177.

J. C. DAWSON, Nacton, Ipswich.
JOSEPH FLINTHAM, The Hall Farm, Aldeburgh-on-Sea.

Border Leicesters and Cheviots.
Classes 178–180, 193 *&* 194.

A. PETERKIN HOPE, Sunwick, Berwick-on-Tweed.
J. R. MARSHALL, Chatton Park, Belford, Northumberland.

Kentish or Romney Marsh.
Classes 181–186.

FRANCIS DE B. COLLARD, Minster Abbey, Ramsgate.
THOMAS POWELL, East Lenham, Maidstone.

Wensleydales.—*Classes* 187 *&* 188.

AARON EWAN, Gooda, Westhouse, Kirkby Lonsdale.
J. O. TROTTER, Holtby Grange, Bedale, Yorks.

Somerset and Dorset Horned.
Classes 191 *&* 192.

JOHN CHICK, Compton Valence, Dorchester.
SAMUEL KIDNER, Bickley, Milverton, Somerset.

Black-faced Mountain, Herdwicks & Welsh.—*Classes* 195–200.

JAMES MACFARLANE, Elibank, Walkerburn, Peeblesshire, N.B.
WILLIAM JONES, Llyngwyn, Chwilog, R.S.O., Carnarvon.

PIGS.

Whites.—*Classes* 201–212.

JOHN ANGUS, Whitefield, Morpeth, Northumberland.
PHILIP ASCROFT, Rufford, near Ormskirk.

Berkshires.—*Classes* 213–216.

ARTHUR HISCOCK, jun., Manor Farm, Motcombe, Shaftesbury.
T. S. MINTON, Montford, Shrewsbury.

Tamworths.—*Classes* 217–220.

EDWARD BURBIDGE, South Wraxall, Bradford-on-Avon.
JOHN WATTS, Fair Green, Chipping Norton, Oxon.

POULTRY.

Classes 221–316.

W. FORRESTER ADDIE, Estate Office, Powis Castle, Welshpool.
EDWARD BROWN, F.L.S., The Chestnuts, Theale, Berks.
EDWARD KENDRICK, Weeford House, Lichfield.
ARTHUR C. MAJOR, Park Farm, Langley, Bucks.
J. P. W. MARX, Basford, Nottingham.

PRODUCE.

Butter and Cream Cheese.

Classes 317–320, 326 *&* 327.

Miss M. JOHNSTONE, Rowridding, Broughton-in-Furness.
Miss WALSH, 4 Lonsdale Road, Barnes, S.W.

Cheese.—*Classes* 321–325.

H. HEWITT, 105 Victoria Street, Westminster, S.W.
G. W. OUBRIDGE, 5 & 7 Town Hall Buildings, Newcastle-on-Tyne.

Cider and Perry.—*Classes* 328–331

H. C. BEDDOE, Castle Street, Hereford.
HENRY SYMONS, Totnes, Devon.

Hops.—*Classes* 332–337.

J. H. MEREDITH, 26 Sansome Street, Worcester.
STUART NEAME, 33 Borough High Street, S.E.

Preserved Fruits and Vegetables.

Classes 338–342.

FREDERIC LAURENCE, 1 Somerfield Terrace, Maidstone.
FREDERICK FISHER, 12 Botolph Lane, London, E.C.

Hives and Honey.—*Classes* 343–366.

Rev. G. W. BANCKS, Green Street Green, Dartford.
W. BROUGHTON CARR, 17 King William Street, W.C.
R. HAMLYN-HARRIS, Villa Rominger, Tübingen, Germany.

HORSE-SHOEING COMPETITIONS.

HENRY G. LEPPER, M.R.C.V.S., Walton Street, Aylesbury
JOHN MALCOLM, F.R.C.V.S., Holliday Street Wharf, Birmingham.

VETERINARY INSPECTORS.

Professor Sir GEORGE BROWN, C.B., Bryn Hyfryd, Harrow.
W. BOWER, M.R.C.V.S., East Rudham, Swaffham.
C. CROWHURST, M.R.C.V.S., Maidstone.
PERCY GREGORY, M.R.C.V.S., Tonbridge, Kent.
H. G. LEPPER, M.R.C.V.S., Walton Street, Aylesbury.
Professor JAMES MCQUEEN, F.R.C.V.S., Royal Veterinary College, Camden Town, N.W.
JOHN MALCOLM, F.R.C.V.S., Holliday Street Wharf, Birmingham.
HARRY MOORE, M.R.C.V.S., Worksop, Notts.
JOHN M. PARKER, M.R.C.V.S., 40 Cannon Street, Birmingham.
HAROLD SESSIONS, F.R.C.V.S., Goldsmid Road, Brighton.
WILLIAM WILSON, F.R.C.V.S., Great Berkhamstead, Herts.

OFFICIAL REPORTER.

W. FREAM, B.Sc., LL.D., 13 Hanover Square, London, W.

AWARDS OF PRIZES AT MAIDSTONE.

ABBREVIATIONS.

I., First Prize. II., Second Prize. III., Third Prize. IV., Fourth Prize. R. N., Reserve Number. H. C., Highly Commended. Com., Commended.

N.B.—The responsibility for the accuracy of the description, pedigree, or eligibility to compete of the animals mentioned below rests solely with the Exhibitors.

Unless otherwise stated, each Prize Animal in the Classes for Horses, Cattle Sheep, and Pigs was "bred by Exhibitor."

HORSES.

Thoroughbred Stallions.

Winners of the Four Queen's Premiums of £150 each, awarded by the Royal Commission on Horse Breeding at the SPRING SHOW, *held at* THE ROYAL AGRICULTURAL HALL, LONDON, *March* 7–9, 1899, *and the Gold Medals, or* £10 *each, awarded by the Local Committee.*

A. WILLIAM WILSON, The Borough, Sanderstead, Croydon, Surrey, for **Chibiabos**, chestnut, foaled in 1892; *s.* Chitabob, *d.* True Love *by* Sterling, *g. d.* Carine *by* Stockwell; breeder, H. Waring.

B. GEORGE JEFFERY & SON, Manor Hotel, Dowsland, Yelverton, Devon, for **Dry Toast**, chestnut, foaled in 1887; *s.* George Frederick, *d.* Tartine *by* Monseigneur, *g. d.* Slice *by* Brown Bread; breeder, the late J. Hume Webster.

C. THE COMPTON STUD, Gillingham, Dorset, for **Grand National**, chestnut, foaled in 1893; *s.* Isobar, *d.* Lethargy *by* General Peel, *g. d.* Sloth *by* Idle Boy; breeder, E. Nicholls.

D. EUSEBIUS G. CROWHURST, Chesham House, Leamington, for **Just in Time**, chestnut, foaled in 1881; *s.* Thunderer, *d.* Reveillée *by* Abergeldie, *g. d.* Alarum *by* Alarm; breeder, the late Thomas Stevens.

Hunters.

No. in Catalogue. **Class 1.**—*Hunter Mares (with Foals at foot), 15 stone and upwards.* [4 entries, 1 absent.]

4 I. (£15.)—F. B. WILKINSON, Cavendish Lodge, Edwinstowe, Newark, for **Lady Templar** 789, bay, foaled 1889 [filly foal *by* Havoc], bred by J. H. Horsley, Southfield House, Cottingham, Yorkshire; *s.* Knight Templar, *d.* Buttercup *by* Edmund Kean.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

2 II. (£10.)—L. H. TAYLOR, Lackham, Chippenham, for **Golden Stream**, brown, foaled 1886 [foal *by* Scotch Hazel], breeder unknown.

Class 2.—*Hunter Mares (with Foals at foot), 12 to 15 stone.* [3 entries, 1 absent.]

7 I. (£15.)—F. B. WILKINSON, Cavendish Lodge, Edwinstowe, Newark, for **Lady Grosvenor** 779, bay, foaled 1889 [colt foal *by* Kilmarnock]; bred by R. T. Greaves, East Carlton, Uppingham, Rutland; *s.* Westminster.

Class 3.—*Hunter Mares or Geldings, exceeding* 13 *stone* 7 *lb., foaled in* 1892, 1893, *or* 1894.[1] [7 entries, 1 absent.]

8 I. (£20.)—SIR H. F. DE TRAFFORD, BT., Hill Crest, Market Harborough, for **Roscommon**, chestnut gelding, foaled 1894, breeder unknown.

10 II. (£10.)—T. D. JOHN, Chaldeans Stud Farm, St. Fagans, Cardiff, for **Gendarme**, chestnut gelding, foaled 1892, bred by J. Mount, Gunby, Lincs.; *s.* Blue Blood.

13 III. (£5.)—WALTER WINANS, Surrenden Park, Pluckley, Kent, for **Golden Dream**, bay gelding, foaled 1894, breeder unknown.

14 R. N.—WALTER WINANS, for **Golden Ray**.

Class 4.—*Hunter Mares or Geldings, not exceeding* 13 *stone* 7 *lb., foaled in* 1892, 1893, *or* 1894.[1] [7 entries, 1 absent.]

18 I. (£20.)—T. D. JOHN, Chaldeans Stud Farm, St. Fagans, Cardiff, for **Sportsman**, bay gelding, foaled 1893, breeder unknown.

19 II. (£10.)—J. H. STOKES, Nether House, Great Bowden, Market Harborough, for **Briton**, bay gelding, foaled 1894, bred by R. L. Bradshaw, Egleton, Oakham; *s.* Belville.

15 III. (£5.)—E. & A. BAXTER, Hutton Hackney Stud, Brentwood, for **Aristides**, bay gelding, foaled 1894, bred by Col. A. T. Digby Neave, Hutton Hall, Brentwood; *s.* Ringoal.

17 R. N.—EDWARD HOYLE, Moorlands, Bacup, Lancashire, for **Bonaparte**.

Class 5.—*Hunter Mares or Geldings, foaled in* 1895.[1] [4 entries, 1 absent.]

25 I. (£20.)—J. H. STOKES, Nether House, Great Bowden, Market Harborough, for **Gold Flake**, chestnut gelding, bred by Marcus Kendall, Ness Hall, Nunnington, Yorks; *s.* War Path, *d.* Wild Mint 1262 *by* Peppermint.

23 II. (£10.)—CLARK & KETTLEWELL, North Ferriby, Brough, Yorks, for **Raby**, chestnut gelding, bred by J. Ingledew, Low Fields, Fencote, Bedale; *s.* Knight of Ruby, *d.* Jess 1421.

24 R. N.—EDWARD HODGSON, The Hollows, Bridlington, Yorks., for **Manxman**.

Class 6.—*Hunter Geldings, foaled in* 1896.[1] [7 entries, none absent.]

30 I. (£15.)—T. D. JOHN, Chaldeans Stud Farm, St. Fagans, Cardiff, for **Huntsman**, chestnut, bred by J. R. Raley, Cayton, Scarborough; *s.* Roscius, *d.* Black Bess *by* Camelot.

---

[1] Prizes given by the Maidstone Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

29 II. (£10.)—EDWARD HODGSON, The Hollows, Bridlington, Yorks., for **Shannon View**, chestnut, bred by Michael O'Brien, Shannon View House, Limerick; *s.* Sir Hugh, *d. by* Rhidorrock.

32 III. (£5.)—G. A. NEWMAN, Panfield Hall, Braintree, for **Marden Ash**, bay, bred by Patrick Moroney, Clonmel; *s.* Young Marden.

28 R. N.—HERBERT HICKS, Branwoods, Great Baddow, Chelmsford, for **Snap Shot.**

Class 7.—*Hunter Fillies, foaled in* 1896. [5 entries, 1 absent.]

33 I. (£15.)—CAPT. F. BOOTHBY, Swallowbeck, Lincoln, for **Belle**, brown, bred by F. Godson, Temple Bruer, Lincs.; *s.* Belville, *d. by* Snowstorm 17.

35 II. (£10.)—JAMES FLOWER, Chilmark, Salisbury, for **True Blue**, brown; *s.* Studley Royal, *d.* Countess.

34 R. N.—JAMES CHRISTY, Writtle, Chelmsford, for **Mainsail.**

Class 8.—*Hunter Geldings, foaled in* 1897.[1] [4 entries, none absent.]

39 I. (£15.)—J. S. DARRELL, West Ayton, York, for **Briskabeg**, chestnut, bred by T. Smith, Briskamore, Clarina, Limerick.

38 II. (£10.)—DAVID CHRISTY, JUN., Margaretting Hall, Ingatestone, for **Valesman**, bay, bred by J. Benett Stanford, Pyt House, Tisbury, Wilts; *s.* Master Ned, *d.* Western Lass 1257.

Class 9.—*Hunter Fillies, foaled in* 1897. [4 entries, none absent.]

44 I. (£15, & R. N. for Champion.[2])—F. WILSON HORSFALL, Potto Grange, Northallerton, for **Queen Mary**, bay, bred by A. Harrowing, Carr View Hall, Sleights, Whitby; *s.* Khartoum, *d.* Revival *by* Sacrados.

42 II. (£10.)—F. S. W. CORNWALLIS, M.P., Linton Park, Maidstone, for bay; *s.* Yard Arm, *d.* Dexterity *by* George Frederick.

45 R. N.—S. LEE SMITH, Larkfield, Maidstone, for **Stella.**

Class 10.—*Hunter Geldings, foaled in* 1898.[1] [2 entries, 1 absent.]

47 I. (£10.)—B. G. H. GEE, Lock's Mills House, Bristol, for **Yorick**, chestnut; *s.* Yard Arm, *d.* Zoe 1274 *by* Zeal.

Class 11.—*Hunter Fillies, foaled in* 1898. [3 entries.]

49 I. (£10, & Champion.[2])—R. E. DIXON, Benningholme, Skirlaugh, Hull, for **Lady Meta**, chestnut; *s.* Otterburn, *d.* Lady Dora 1075 *by* Gallant.

48 II. (£5.)—WM. CHAMBERS, Manor House, Southfleet, Gravesend, for chestnut; *s.* King's Beadsman, *d.* Kitty.

50 R. N. & H. C.—S. LEE SMITH, Larkfield, Maidstone, for **Mermaid.**

---

[1] Prizes given by the Maidstone Local Committee.
[2] Gold Medal, value £10 10*s.*, given by the Hunters' Improvement Society for the best Hunter Filly exhibited in Classes 7, 9, and 11.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Cleveland Bays and Coach Horses.

Class 12.—*Cleveland Bay or Coaching Stallions, foaled in* 1896. [3 entries.]

51 I. (£15.)—HICKMAN & SCUTT, Swinefleet, Goole, for **Partners** 2222, bay, *s.* Prince Victor 376, *d.* Patience 118 *by* Cyrus 113.

52 II. (£10.)—ROBERT KITCHING, Hungate, Pickering, for **Lord Bob,** 2223, bay, bred by J. Duck, Farndale, Kirbymoorside; *s.* Farndale Forester 1732, *d. by* Cleveland 90.

53 R. N. & Com.—JOHN LETT, Cleveland Stud Farm, Rillington, York, for **Favourite Lad.**

Class 13.—*Cleveland Bay or Coaching Stallions, foaled in* 1897. [4 entries, 1 absent.]

55 I. (£15.)—H. C. STEPHENS, M.P., Cholderton, Salisbury, for **Wellington** 1488, bay; *s.* Marston 1080, *d.* Greta 700 *by* Tertius 926.

56 II. (£10.)—F. H. STERICKER, Westgate House, Pickering, for **Sir Horace** 2264, bay, bred by W. Cooper, Hall Farm, Otterington, Northallerton; *s.* Prince of Wales 371, *d. by* Luck's All 1114.

54 R. N. & Com.—F. WILSON HORSFALL, Potto Grange, Northallerton, for **Which Won.**

Class 14.—*Cleveland Bay or Coaching Mares (with Foals at foot).* [4 entries.]

58 I. (£15.)—F. WILSON HORSFALL, Potto Grange, Northallerton, for **Lady Salton** 1068, bay, foaled 1896 [foal by Chloraine 1373], bred by H. C. Stephens, M.P., Cholderton, Salisbury; *s.* Luck's All 189, *d.* Countess of Salton 315 *by* Fidius Dius 107.

59 II. (£10.)—H. C. STEPHENS, M.P., Cholderton, Salisbury, for **Young Sally** 1012, bay, foaled 1895 [foal by Marston 1080]; *s.* Luck's All 189, *d.* Sally 90 *by* Newton 216.

60 III. (£5.)—H. C. STEPHENS, M.P., Cholderton, Salisbury, for **Fanny Drake** 169, bay, foaled 1880, bred by Andrew Moscrop, New Marske, Yorks; *s.* Fidius Dius 107, *d. by* Duke of Cleveland 98.

61 R. N.—H. C. STEPHENS, M.P., for **Madam.**

Class 15.—*Cleveland Bay or Coaching Fillies, foaled in* 1896 *or* 1897. [8 entries, 1 absent.]

69 I. (£15.)—JOHN WHITE, The Grange, Appleton Roebuck, Bolton Percy, Yorks, for **Topsy** 843, bay, foaled 1897; *s.* Lord Risby 1402, *d.* Ainsty Queen 367 *by* Favourite 581.

65 II. (£10.)—F. WILSON HORSFALL, Potto Grange, Northallerton, for **Perseverance** 840, bay, foaled 1897, bred by T. Jackson, Upton Hall, Lythe, Whitby; *s.* Prince George 367, *d. by* Candidate 64.

68 III. (£5.)—H. C. STEPHENS, M.P., Cholderton, Salisbury, for **Miss Welcome** 1075, bay, foaled 1896; *s.* Marston 1080, *d.* Festivity.

67 R. N. & H. C.—H. C. STEPHENS, M.P., for **Empress.**

64 H. C.—JAMES FINCH, for **Queen Victoria.**

66 Com.—H. C. STEPHENS, M.P., for **Diamond.**

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Hackneys.

Class 16.—*Hackney Stallions, foaled in* 1896, 14 *hands* 2 *inches and upwards.* [8 entries, 1 absent.]

75 I. (£15, & Champion.[1])—HARRY LIVESEY, Rotherfield, Sussex, for **McKinley** 6475, chestnut, bred by A. Craggy, Manor House, North Newbald, Brough; *s.* Garton Duke of Connaught 3009, *d.* Lady Willerby 2239 *by* Romeo 1340.

73 II. (£10, & R. N. for Champion.[1])—SIR WALTER GILBEY, BT., Elsenham Hall, Essex, for **Danish Duke** 6329, chestnut, bred by F. Wrench, Killacoona, Ballybrack, Dublin; *s.* Clovelly 4690, *d.* Park House Duchess 5966 *by* Prince Alfred 1325.

77 III. (£5.)—GEORGE C. WAUD, Fernichurst, Baildon, Yorks, for **Blucher 3rd** 6282, chestnut, bred by Tom Mitchell, The Park, Eccleshill, Bradford; *s.* Ganymede 2076, *d.* Dinah 2009 *by* Denmark 177.

72 R. N. & H. C.—SIDNEY BRUNTON, Frogmore House, St. Albans, for **Rosebery 2nd.**

71 H. C.—JOHN BARKER, for **Dane's Isle.**

70 Com.—JOHN BARKER, for **Celtic.**

Class 17.—*Hackney Stallions, foaled in* 1897. [5 entries, 1 absent.]

81 I. (£15.)—ALFRED LEWIS, Church Farm Stud, Heacham, King's Lynn, for **Heacham Gabriel**, bay, bred by E. Smith, Cross Drain Farm, Littleport, Cambs.; *s.* Stow Gabriel 5416, *d.* May Day 10283 *by* Lord Donoghue 3743.

82 II. (£10.)—J. M. MITCHELSEN, The Hall, Pickering, for **Pickering Sirdar**, chestnut; *s.* Langton 6078, *d.* Pickering Bell *by* Garton Duke of Connaught 3009.

78 R. N. & H. C.—SIR WALTER GILBEY, BT., Elsenham Hall, Essex, for **Bright Squire.**

80 Com.—THE HORSLEY STUD CO., for **Horsley Squire.**

Class 18.—*Hackney Stallions, foaled in* 1898. [8 entries, 1 *absent.*]

86 I. (£15.)—H. B. CORY, Druidstone, Castleton, Cardiff, for **St. Donats**, chestnut, bred by E. K. Moulton, The Limes, Downham, Norfolk; *s.* Stow Gabriel 5416, *d.* Princess 6032 *by* Renown 1887.

83 II. (£10.)—JOHN BARKER, The Grange, Bishop's Stortford, for **Royal Nut**, chestnut; *s.* Royal Dane 5782, *d.* Sweet Nut 10552 *by* Cadet 1251.

87 III. (£5.)—BARONESS DE LUSSAN, Woodcroft Castle, Market Deeping, for **Strathearn**, chestnut; *s.* Garton Duke of Connaught 3009, *d.* Flossette 3822 *by* Lord Gowan 1303.

88 R. N. & H. C.—BARONESS DE LUSSAN, for **Viceroy.**

85 H. C.—F. E. COLMAN, for **Nork Sensation.**

84 Com.—J. D. CHARRINGTON, for **Conclusion.**

---

[1] Gold Medal given by the Hackney Horse Society for the best Hackney Stallion exhibited in Classes 16-18.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 19.—*Hackney Mares (with Foals at foot), 14 hands 2 inches and upwards.* [10 entries, 4 absent.]

95 **I.** (£15, & **Champion.**[1])—HARRY LIVESEY, Rotherfield, Sussex, for **Orange Blossom** 5957, chestnut, foaled 1891 [foal *by* Goldfinder 6th 1791], bred by W. Baxter, Burton Pidsea, Hull; *s.* Connaught 1453, *d.* Orange Girl 2nd 8347 *by* General Gordon 2084.

91 **II.** (£10.)—JOHN BARKER, The Grange, Bishop's Stortford, for **Loving Cup** 9649, chestnut, foaled 1894, [foal *by* Spitfire 6907], bred by Holt Nutt, Guy Wells. Whaplode, Spalding, Lincs.; *s.* Ganymede 2076, *d.* Whaplode Duchess 6301 *by* Connaught 1453.

93 **III.** (£5.)—C. E. GALBRAITH, Terregles, Dumfries, N.B., for **Queen of the West** 11422, chestnut roan, foaled 1893 [foal *by* Danebury 4724], bred by C. Harrison, Barneby House, Bossall, Yorks; *s.* Garton Duke of Connaught 3009, *d.* Queen of the Dales 4617 *by* Eddlethorpe Fireaway 1768.

100 **R. N. & H. C.**—R. T. THORNTON, Middleton Hall, Brentwood, for **Chloris.**
97 **H. C.**—B. OAKES, for **Danish Poppy.**
99 **Com.**—D'ARCY REEVE, for **Nettie.**

Class 20.—*Hackney Fillies, foaled in* 1897. [12 entries, 3 absent.]

105 **I.** (£15.)—H. B. CORY, Druidstone, Castleton, Cardiff, for **Druidstone Duchess** 11770, chestnut; *s.* Agility 2799, *d.* Dainty Duchess 7745 *by* Garton Duke of Connaught 3009.

109 **II.** (£10.)—SIR WALTER GILBEY, BT., Elsenham Hall, Essex, for **Kiss Me Quick** 11938, chestnut, bred by Nathaniel Morton, Brookville, Ballymena, co. Antrim; *s.* Yorkshire Post 5076, *d.* Merry Auburn 10299 *by* Ganymede 2076.

106 **III.** (£5.)—BARONESS DE LUSSAN, Woodcroft Castle, Market Deeping, for **Rosalind** 12260, chestnut bred by E. Edmondson, Springfield Hall, Knowle; *s.* His Majesty 2513, *d.* Gracilis 2788 *by* Cadet 1251.

107 **R. N. & H. C.**—C. E. GALBRAITH, Terregles, Dumfries, N.B., for **Atalanta.**
103 **H. C.**—JOHN BARKER, for **Princess May.**
Com.—SIR WALTER GILBEY, BT., for No. 108, **Bright Dorothy**; W. LAWSON, for No. 110, **Iolanthe.**

Class 21.—*Hackney Fillies, foaled in* 1898. [4 entries, 1 absent.]

114 **I.** (£10.)—SIR WALTER GILBEY, BT., Elsenham Hall, Essex, for **Bonny Lady**, chestnut; *s.* Royal Danegelt 5785, *d.* Lady Dunham 2894 *by* Cadet 1251.

113 **II.** (£5.)—JOHN BARKER, The Grange, Bishop's Stortford, for **Woodtonian**, chestnut; *s.* Agility 2799, *d.* Woodbine 11583 *by* Naffertonian 1527.

115 **R. N.**—LORD MIDDLETON, Birdsall House, York, for **Birdsall Daisy Belle.**

Class 22.—*Hackney Mares or Geldings, 14 hands 2 inches and upwards, foaled in* 1892, 1893, 1894, *or* 1895.[2] [4 entries, none absent.]

117 **I.** (£15.)—E. & A. BAXTER, Hutton Hackney Stud, Brentwood, for **Lady Nell** 9155, brown mare, foaled 1894, bred by H. Hind, Highfield, Wyke, Bradford; *s.* Danger 4216, *d.* Nellie Bly 4477 *by* Robin Adair 1545.

[1] Gold Medal given by the Hackney Horse Society for the best Hackney Mare or Filly exhibited in Classes 19–21.
[2] Prizes given by the Maidstone Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

118 **II.** (£10.)—W. H. CROWHURST, The Paddock, Canterbury, for **Bravo**, brown gelding, foaled 1893, breeder unknown.

119 **R. N.**—WALTER T. FREMLIN, Milgate Park, Maidstone, for **Cairo.**

Class 23.—*Hackney Mares or Geldings, foaled in* 1896.[1]
[4 entries, none absent.]

123 **I.** (£15.)—C. E. GALBRAITH, Terregles, Dumfries, N.B., for **Rosadora** 11437, chestnut mare, bred by J. F. Richardson, Norton Lodge, Malton; *s.* Rosador 4964, *d.* Wild Daisy 6311 *by* Wildfire 1224.

122 **II.** (£10.)—JOHN BARKER, The Grange, Bishop's Stortford, for **Lady Millie** 11153, chestnut mare; *s.* Agility 2799, *d.* Lady Mildred 9147 *by* Danegelt 174.

121 **R. N.**—JOHN BARKER, for **Comedy.**

Ponies.

Class 24.—*Pony Stallions, not exceeding* 14 *hands.*
[5 entries, 1 absent.]

127 **I.** (£15.)—WILLIAM HOLLINS, Pleasley Vale, Mansfield, Notts, for **Confident George**, black, foaled 1895; *s.* Portwood Confidence 3201, *d.* Georgina 6th 7915 *by* Little Wonder 2nd 1610.

129 **II.** (£10.)—S. WOODIWISS, Sedgemere, East Finchley, for **Hexham** 6400, black, foaled 1893, bred by L. H. Armstrong, Abbey House, Hexham; *s.* Garton Fireaway 2479, *d.* Pomona 3194 *by* Harvester 1799.

126 **R. N.**—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Sir Baldic.**

Class 25.—*Pony Mares (with Foals at foot), not exceeding* 14 *hands.*
[2 entries.]

131 **I.** (£15.)—WILLIAM HOLLINS, Pleasley Vale, Mansfield, Notts, for **Windsor Snorer** 8583, bay, foaled 1889 [foal *by* Prospector 6516], bred by C. W. Wilson, Rigmaden Park, Kirkby Lonsdale; *s.* Sir George 778, *d.* Snorer 2456 *by* Sir George 778.

130 **R. N.**—WILLIAM HOLLINS, for **Lady Jane.**

Class 26.—*Pony Colts, Geldings, or Fillies, foaled in* 1897, *the produce of a Mare registered in or accepted by inspection for the Hackney Stud Book as a Pony, and which in the opinion of the Judges will not exceed* 14 *hands at* 4 *years old.*[1]
[6 entries, 3 absent.]

135 **I.** (£15.)—WILLIAM HOLLINS, Pleasley Vale, Mansfield, Notts, for **Berry Hill Sniff**, bay filly; *s.* Prospector 6516, *d.* Miss Sniff 11316 *by* Cassius 2397.

133 **II.** (£10.)—JOHN HALSTED, Heckenhurst, Worsthorne, Burnley, for **Lucy Gordon** 12062, bay filly; *s.* General Gordon 2084, *d.* Daisy No. 995 Inspected F.S.

137 **R. N.**—HERBERT T. PARKE, Withnell Fold, Chorley, Lancs., for **Olive Model.**

---

[1] Prizes given by the Maidstone Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 27.—*Pony Colts, Geldings, or Fillies, foaled in* 1898, *the produce of a Mare registered in or accepted by inspection for the Hackney Stud Book as a Pony, and which in the opinion of the Judges will not exceed* 14 *hands at* 4 *years old.*[1]
[7 entries, 4 absent.]

139 I. (£15.)—CAPT. CLIFFORD CULLEN, Wollaton, Nottingham, for **Grand Cavalier**, chestnut colt; *s.* Grand Cadet 4797, *d.* Rita 8416 *by* Rarey 1883.

144 II. (£10.)—S. WOODIWISS, Sedgemere, East Finchley, for **Sedgemere Lily Wonder**, bay filly; *s.* Little Wonder 2nd 1610, *d.* Lady Lilian No. 1328 Inspected F.S., *by* Little Wonder 2nd 1610.

141 R. N.—WILLIAM HOLLINS, Pleasley Vale, Mansfield, Notts, for bay.

Shetland Ponies.

Class 28.—*Shetland Pony Stallions, not exceeding* 10 *hands* 2 *inches, foaled before or in* 1896.[1] [10 entries, 2 absent.]

146 I. (£7.)—THE LADIES E. & D. HOPE, Great Hollenden Farm, Under River, Sevenoaks, for **Oman** 33, brown, foaled 1885, bred by Marquis of Londonderry, K.G., Bressay, Shetland, N.B.; *s.* Prince of Thule 36, *d.* Norna 198 *by* Lord of the Isles 26.

148 II. (£3.)—COUNTESS OF HOPETOUN, Hopetoun House, South Queensferry, N.B., for **Magician** 154, foaled 1892; *s.* Jill 19, *d.* Mimosa 131 *by* Jill 19.

145 R. N. & H. C.—SIR WALTER GILBEY, BT., Elsenham Hall, Essex, for **Good Friday**.

152 H. C.—R. W. R. MACKENZIE, for **Bonaparte**.

Class 29.—*Shetland Pony Mares, not exceeding* 10 *hands* 2 *inches, foaled before or in* 1896.[1] [11 entries, 1 absent.]

161 I. (£7.)—THE LADIES E. & D. HOPE, Great Hollenden Farm, Under River, Sevenoaks, for **Vementry 2nd** 1104, brown, foaled 1892, bred by Marquis of Londonderry, K.G., Bressay, Shetland, N.B.; *s.* Lord of the Isles 26, *d.* Vesta 215 *by* Prince of Thule 36.

163 II. (£3.) MRS. WENTWORTH HOPE JOHNSTONE, Skeynes, Edenbridge, for **Emerald**, mouse, foaled 1893, bred by Marquis of Londonderry, K.G., Bressay, Shetland, N.B.; *s.* Odin 32, *d.* Eppie 180 *by* Jack 16.

155 R. N. & H. C.—MASTER LIONEL DAVISON, Roydon Hall, Tonbridge, for **Heather**.

H. C.—THE LADIES E. & D. HOPE, for No. 160, **Scythia**; MRS. WENTWORTH HOPE JOHNSTONE, for No. 164, **Sapphire**.

Mountain and Moorland Ponies.

(Including Dartmoor, Exmoor, New Forest and Welsh Breeds.)

Class 30.—*Mountain or Moorland Pony Stallions, foaled before or in* 1896, *not exceeding* 12 *hands* 2 *inches.* [4 entries, none absent.]

168 I. (£10.)—H. MEURIC LLOYD, Glanyrannell, Llanwrda, R.S.O., Carmarthenshire, for **Starlight** 167, grey, foaled 1894; *s.* Glassallt, *d.* Moonlight 908.

[1] Prizes given by the Maidstone Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 31.—*Mountain or Moorland Pony Mares, foaled before or in* 1896, *not exceeding* 12 *hands* 2 *inches.* [7 entries, none absent.]

174 **I.** (£10.)—THE DUCHESS OF NEWCASTLE, Clumber, Worksop, for **Lady White**, foaled 1890, breeder unknown.

170 **II.** (£5.)—LORDS A. AND L. CECIL, The Mount, Lymington, Hants, for **Crescent** 872, bay, bred by S. Biddlecombe, Beaulieu Rails, Southampton.

175 **R. N. & H. C.**—DAVID REES, Cwymclyd, Mothvey, Llandovery, S. Wales, for **Star 1st**, silver chestnut, foaled 1896; *s.* Merlyn Myddfai, *d.* Lady Mary.

172 **H. C.**—MISS ELPHICK, for **Novelette.**

Polo Ponies.

Class 32.—*Polo Pony Stallions, not exceeding* 14 *hands* 2 *inches.*[1] [6 entries, none absent.]

179 **I.** (£15, & **Champion.**[2])—SIR WALTER GILBEY, BT., Elsenham Hall, Essex, for **Rosewater** 37, bay, foaled 1883, bred by A. W. Elphick, Preston Park, Brighton; *s.* Rosicrucian, *d.* Lady Day 2nd *by* Saint Mungo.

180 **II.** (£10.)—THE HORSLEY STUD Co., Cobham, Surrey, for **Gown Boy** 114, chestnut, foaled 1896, bred by S. Hughes Hewitt, Sports Club, S.W.; *s.* Montezuma, *d.* Santa Zita *by* Galliard.

177 **III.** (£5.)—JOHN BARKER, The Grange, Bishop's Stortford, for **Sandiway** 121, bay, foaled 1895, bred by Sir H. F. de Trafford, Bt., 18 Arlington Street, W.; *s.* Rosewater 37, *d.* Cuddington 50 *by* Cucumber.

182 **R. N.**—MRS. PURCELL, Sutton Coldfield, for **Bread Sauce.**

Class 33.—*Polo Pony Stallions (Eastern Ponies), not exceeding* 14 *hands* 2 *inches.*[1] [4 entries.]

185 **I.** (£15.)—JOHN CORBETT, Impney, Droitwich, for **Safran** 143, grey foaled 1893, bred by W. S. Blunt, Crabbet Park, Three Bridges, Sussex; *s.* Shahwan 38, *d.* Safra.

186 **II.** (£10.)—G. NORRIS MIDWOOD, The Hut, Tabley, Knutsford, for **The Bey** 108, bay, foaled 1886, bred in Arabia.

183 **R. N. & H. C.**—REGINALD E. CECIL, 8th Hussars, Curragh Camp, co. Kildare, for **Ben Azrek.**

184 **H. C.**—JOHN CORBETT, Impney, Droitwich, for **Rodan.**

Class 34.—*Polo Pony Stallions, not exceeding* 13 *hands* 2 *inches.*[1] [2 entries.]

187 **I.** (£15, & **R. N. for Champion.**[2])—SIR WALTER GILBEY, BT., Elsenham Hall, Essex, for **Lord Polo** 135, chestnut, foaled 1893, bred by Sir H. F. de Trafford, Bt., Trafford Park, Manchester; *s.* Rosewater 37, *d.* Lady Florence 142.

188 **II.** (£10.)—G. NORRIS MIDWOOD, The Hut, Tabley, Knutsford, for **Hurlingham** 90, chestnut, foaled 1894, bred by Sir H. F. de Trafford, Bt., Trafford Park, Manchester; *s.* Rosewater 37, *d.* Esmeralda 67.

---

[1] Prizes given by the Maidstone Local Committee.
[2] Gold Medal given by the Polo Pony Society for the best Polo Pony Stallion exhibited in Classes 32–34.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 35.—*Polo Pony Mares, above* 13 *hands* 2 *inches and not exceeding* 14 *hands* 2 *inches, with Foals at foot, or to Foal in* 1899.[1] [8 entries, 1 absent.]

189 **I. (£15, & Champion.[2])**—JOHN BARKER, The Grange, Bishop's Stortford, for **Lightning** 726, chestnut, aged [foal *by* Sandiway 121], breeder unknown.

194 **II. (£10, & R.N. for Champion.[2])**—THE KEYNSHAM STUD CO., The Lodge Stud Farm, Keynsham, Somerset, for **Oh My** 425, chestnut, foaled 1879 [foal *by* Whitehall], bred by W. Bowers, Woodside, Nantwich; *s.* Belgrave, *d.* Corwen Fanny.

93 **III. (£5.)**—THE KEYNSHAM STUD CO., for **First Flight** 615, brown, foaled 1888 [foal *by* Whitehall], bred by S. Bennett, Says Farm, Coalpit Heath, Glos.; *s.* Balqudahar, *d.* Polly 562.

R. N. & H. C.—JOHN BARKER, for **Silvertail.**

H. C.—AUDLEY BLYTH, for No. 191, **Fine Fleur**; Sir H. F. de Trafford, Bt., for No. 192, **Confidential.**

Class 36.—*Polo Pony Mares, not exceeding* 13 *hands* 2 *inches, with Foals at foot, or to Foal in* 1899.[1] [5 entries, 1 absent.]

198 **I. (£15.)**—WILLIAM HOLLINS, Pleasley Vale, Mansfield, Notts, for **Snorter 2nd**, bay, foaled 1893 [foal *by* Prospector], bred by Sir H. F. de Trafford, Bt., Trafford Park, Manchester; *s.* Cassius, *d.* Snorer 2nd 268 *by* Sir George.

197 **II. (£10.)**—JOHN BARKER, The Grange, Bishop's Stortford, for **Jeanie** 630, chestnut, aged [foal *by* Sandiway 121], breeder unknown.

Class 37.—*Polo Pony Colts, Geldings, or Fillies, foaled in* 1896, *not exceeding* 14 *hands* 1 *inch.*[1] [4 entries, none absent.]

203 **I. (£10.)**—THE KEYNSHAM STUD CO, The Lodge Stud Farm, Keynsham, for **St. Moritz**, chestnut gelding, bred by Stuart Forster, Postlip Hall, Winchcombe; *s.* Mootrub 32, *d.* Sally 668.

205 **II. (£7.)**—MISS TYRRELL, Ivy Cot, Sidmouth, for **The Judge**, brown gelding; *s.* Hawkstone 2nd, *d.* Lerra 283 *by* Tormentor.

202 **R. N.**—WILLIAM HOLLINS, Pleasley Vale, Mansfield, for bay filly; *s.* Sahowlee, *d.* Lady Eastcote 385 *by* Sir George.

Class 38.—*Polo Pony Colts, Geldings, or Fillies, foaled in* 1897, *not exceeding* 14 *hands.*[1] [8 entries, none absent.]

212 **I. (£10.)**—WILLIAM STONEBRIDGE, Pattison Farm, Alchington, Hythe, Kent, for **Primrose Dame**, chestnut filly; *s.* Blue Grass Again, *d.* Daisy *by* Hermit.

209 **II. (£7.)**—THE KEYNSHAM STUD CO., The Lodge Stud Farm, Keynsham for **Birmingham Royal** 127, chestnut colt, bred by Stuart Forster, Postlip Hall, Winchcombe; *s.* Mootrub 32, *d.* Sally 668.

211 **III. (£3.)**—G. NORRIS MIDWOOD, The Hut, Tabley, Knutsford, for **Hazel** 709, chestnut filly, bred by T. Hazlehurst, Plumbley, Knutsford; *s.* The Bey 108.

---

[1] Prizes given by the Maidstone Local Committee.
[2] Gold Medal given by the Polo Pony Society for the best Polo Pony Mare exhibited in Classes 35 and 36.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

207 **R. N. & H. C.**—W. HOLLINS, Pleasley Vale, Mansfield, for brown filly; *s.* Snorter, *d.* Georgina 2nd.

213 **H. C.**—MISS TYRRELL, for **Mavourneen.**

Class 39.—*Polo Pony Colts, Geldings, or Fillies, foaled in* 1898.[1] [10 entries, none absent.]

220 **I.** (£10.)—THE KEYNSHAM STUD Co., The Lodge Stud Farm, Keynsham, Somerset, for **Maidstone Royal** 136, chestnut colt, bred by Stuart Forster, Postlip Hall, Winchcombe; *s.* Mootrub 32, *d.* Sally 668.

222 **II.** (£7.)—J. HENRY STOCK, M.P., The White Hall, Tarporley, for **Silver**, brown filly; *s.* Sentinel, *d.* Zither 473.

217 **III.** (£3.)—SIR H. F. DE TRAFFORD, BT., Hill Crest, Market Harborough, for **Rosemary**, chestnut filly; *s.* Rosewater 37, *d.* Flirt 84.

215 **R. N. & H. C.**—CAPT. CLIFFORD CULLEN, Wollaton, Nottingham, for **Gnat.**

216 **H. C.**—SIR H. F. DE TRAFFORD, BT., for **Confidence.**

221 **Com.**—G. NORRIS MIDWOOD, for **Shy Girl.**

Harness Horses and Ponies.

Class 40.—*Harness Mares or Geldings, of any age, above* 15 *hands.*[1] [9 entries, 5 absent.]

227 **I.** (£15.)—E. S. GODSELL, Stroud, Glos., for **Lady Lofty** 5594, brow mare, foaled 1888, bred by James Coker, Beetley Hall, East Dereham Norfolk; *s.* White Stockings 1415, *d.* Beauty 16 *by* A1 1.

228 **II.** (£10.)—JOHNSON & DIGBY, Woodbridge, Suffolk, for brown mare, foaled 1894, bred by James Coker, Beetley Hall, East Dereham, Norfolk; *s.* Coker's Defiance 4696, *d.* Coker's Nelly 6942 *by* The Norman 3171.

230 **R. N.**—EDWIN THORNTON, St. Mark's House, New Brompton, Kent, fo **All Fours.**

Class 41.—*Harness Mares or Geldings of any age, above* 14 *and not exceeding* 15 *hands.*[1] [13 entries, 3 absent.]

243 **I.** (£15.)—MRS. W. W. ROBERTSON, Blounts Court, Reading, for **Gavotte** 9972, black mare, foaled 1894, bred by Tom Mitchell, The Park, Eccleshill, Bradford; *s.* Lord Rattler 2566, *d.* Faithful *by* Foston Fireaway 288.

233 **II.** (£10.)—E. & A. BAXTER, Hackney Stud, Hutton, Brentwood, Essex, for **Miss Howard** 12134, bay mare, foaled 1893, bred by William Rook, Bielby, Everingham, Yorks; *s.* Sensation 6th 3265, *d.* Bielby Princess 5034 *by* King Charley 392.

245 **III.** (£5.)—GEORGE C. WAUD, Ferniehurst, Baildon, Yorks, for **Brompton Princess** 8707, brown mare, foaled 1894, bred by George Richardson, North Grimston; *s.* Garton Duke of Connaught 3009, *d.* Grimston Nellie (late Nellie) 3131 *by* Matchless of Londesboro' 1517.

244 **R. N. & H. C.**—R. T. THORNTON, Middleton Hall, Brentwood, for **Amanda.**

238 **H. C.**—ALFRED LEWIS, for **Juggler.**

Class 42.—*Harness Pony Mares or Geldings of any age, not exceeding* 14 *hands.*[1] [12 entries, 3 absent.]

252 **I.** (£15.)—G. E. FRANKLIN, The Field, Osmaston Road, Derby, for **Lord Gobang**, bay gelding, foaled 1892, bred by Charles Manning, Northampton; *s.* Fashion, *d.* Welsh Pony.

[1] Prizes given by the Maidstone Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

250 II. (£10.)—WILLIAM FOSTER, Mel Valley, Moseley, Worcs., for **Queen Bess**, black mare, foaled 1895, bred by W. Kerrison, Fakenham, Norfolk; *s.* Recruit 1884, *d.* Black Bess 6408 *by* Recruit 1884.

256 III. (£5.)—MRS. W. W. ROBERTSON, Blount's Court, Reading, for **Encore**, brown mare, foaled 1894, bred by Alexander Morton, Gowanbank, Darvel, N.B.; *s.* Lord Bang 1030.

254 R. N. & H. C.—WILLIAM HOLLINS, Pleasley Vale, Mansfield, for **Nottingham Lass.**

253 H. C.—E. S. GODSELL, for **Jersey Lily.**

246 Com.—RICHARD BURBIDGE, for **Midnight Queen.**

Shires.

Class 43.—*Shire Stallions, foaled in* 1896. [11 entries, 6 absent.]

260 I. (£20, & Champion.[1])—ALEXANDER HENDERSON, M.P., Buscot Park, Faringdon, Berks., for **Buscot Harold** 16576, bay; *s.* Markeaton Royal Harold 15225, *d.* Aurea 13951 *by* Thornton Premier 12551.

268 II. (£10.)—JOSEPH WAINWRIGHT, Great Rocks Stud, Buxton, for **Rocks Commander**, 16924, black, bred by T. J. Dutton, Saltney, Chester; *s.* Bury Victor Chief 11105, *d.* Jeannette 5034 *by* Royal Sandy 3993.

263 III. (£5.)—SIR J. BLUNDELL MAPLE, BT., M.P., Childwick, St. Albans, for **Pioneer 7th** 16890, black, bred by A. E. S. Hepworth, Blackthorn, Bicester; *s.* Harold's Pilot 11564, *d.* Flower 23736 *by* Thumper 17th 17034.

262 R. N. & H. C.—SIR J. BLUNDELL MAPLE, BT., M.P., for **Childwick Majestic.**

258 H. C.—F. S. W. CORNWALLIS, M.P., for **Linton Settling Day.**

Class 44.—*Shire Stallions, foaled in* 1897. [9 entries, 2 absent.]

276 I. (£20, & R. N. for Champion.[1])—ARTHUR RANSOM, Hitchin, Herts., for **Hitchin Ringleader** 17397, bay, bred by E. E. Harcourt-Vernon, Grove, Retford; *s.* Calwich Heirloom 14547, *d.* Grove Vera *by* Harold 3703.

277 II. (£10.)—JOSEPH WAINWRIGHT, Great Rocks Stud, Buxton, for **Rocks Chief** 17561, black, bred by Miss A. Hick, Mytton Hall, Whalley; *s.* Bury Victor Chief 11105, *d.* Primrose 13194 *by* Don Carlos 2416.

270 III. (£5.)—CAPTAIN W. H. O. DUNCOMBE, Waresley Park, Sandy, for **Sentinel 2nd** 17612, bay, bred by W. Richardson, London Road, Chatteris; *s.* Duncan 3rd 13006, *d.* Watchgirl 11214 *by* Watchman 5419.

272 R. N. & H. C.—LORD HOTHFIELD, Ashford, for **Xerxes of Hothfield.**

271 H. C.—EDWARD GREEN, for **Moor's Regent.**

Class 45.—*Shire Stallions, foaled in* 1898. [13 entries, 4 absent.]

278 I. (£15.)—H.R.H. THE PRINCE OF WALES, K.G., Sandringham, Norfolk, for **Benedick**, bay; *s.* Prince Harold 14228, *d.* Hendre Beatrice 12193 *by* Ruler 3rd 6353.

290 II. (£10.)—LORD WANTAGE, K.C.B., V.C., Lockinge, Wantage, Berks., for **Buscot Senator**, bay, bred by A. Henderson, M.P., Buscot Park, Faringdon; *s.* Markeaton Royal Harold 15225, *d.* Asenath 2nd 16031 *by* Dunsmore Alderman 11322.

[1] Gold Medal given by the Shire Horse Society for the best Shire Stallion exhibited in Classes 43-45.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

287 **III.** (£5.)—LORD ROTHSCHILD, Tring Park, Herts., for **Victor of Hitchin**, bay, bred by Arthur Ransom, Hitchin; *s.* Yorkshire Lad 5th 15947, *d.* Hitchin Queen 14938 *by* Hitchin Duke 9586.

286 **R. N. & H. C.**—P. A. MUNTZ, M.P., Dunsmore, Rugby, for **Dunsmore Judge.**
H. C.—R. W. HUDSON, for No. 284, **Danesfield Duke**; SIR J. BLUNDELL MAPLE, BART., M.P., for No. 285, **St. Albans.**

280 **Com.**—FRED CRISP, for **Girton Ensign.**

Class 46.—*Shire Mares (with Foals at foot).* [15 entries, 10 absent.]

305 **I.** (£20, & **R.N. for Champion.**[1])—LORD WANTAGE, K.C.B., V.C., Lockinge, Wantage, for **Hendre Crown Princess** 21896, brown, foaled 1895 [foal *by* Prince William 3956], bred by John Thorley, Mayfield, Ashbourne; *s.* Prince Harold 14228, *d. by* President 3939.

298 **II.** (£10.)—LORD HOTHFIELD, Hothfield Place, Ashford, for **Dunsmore Chintz** 14643, bay, foaled 1891 [foal *by* Prince Harold 14228], bred by J. Messinger, Church Brampton, Northampton; *s.* Wiseton 10811, *d.* Maidford Whitefoot 3443 *by* Noble 1639.

291 **III.** (£5.)—H. H. SMITH CARINGTON, Ashby Folville Manor, Melton Mowbray, for **Waresley Maxima** 19078, bay, foaled 1892 [foal *by* Rokeby Plutus 16363], bred by Capt. W. H. O. Duncombe, Waresley Park, Sandy; *s.* Hitchin Conqueror 4458, *d.* Lady Maxey 6573 *by* Peterborough Tom 3250.

299 **R. N. & H. C.**—R. W. HUDSON, Danesfield, Great Marlow, for **Methwold Rose.**

Class 47.—*Shire Fillies, foaled in* 1896. [10 entries, 2 absent.]

308 **I.** (£15, & **Champion.**[1])—CAPT. W. H. O. DUNCOMBE, Waresley Park, Sandy, for **Boro' Royal** 23089, brown, bred by B. Brown, Thorney, Peterborough; *s.* The Colonel V. 10617, *d.* Fanny *by* Chancellor 4959.

315 **II.** (£10.)—LORD ROTHSCHILD, Tring Park, Herts., for **Hendre Sunlight**, 23903, roan, bred by Lord Llangattock, The Hendre, Monmouth; *s.* Prince Harold 14228, *d.* Hendre Duchess 13411 *by* Glendon 2nd 935.

312 **III.** (£5.)—SIR J. BLUNDELL MAPLE, BT., M.P., Childwick, St. Albans, for **Stanley Commotion** 24812, bay, bred by W. Parker, Great Stanney Hall, Chester; *s.* Seldom Seen 15348, *d.* Stanney Pride 22502 *by* Vulcan 4145.

309 **R. N. & H. C.**—WALPOLE GREENWELL, Marden Park, Caterham Valley, for **Harold's Gem.**

Class 48.—*Shire Fillies, foaled in* 1897. [15 entries, 4 absent.]

326 **I.** (£15.)—SIR J. BLUNDELL MAPLE, BT., M.P., Childwick, St. Albans, for **Victor's Queen** 27158, black, bred by H.R.H. The Prince of Wales, K.G., Sandringham; *s.* Bury Victor Chief 11105, *d.* Solace 24787 *by* Lord Arthur 9834.

324 **II.** (£10.)—R. W. HUDSON, Danesfield, Great Marlow, for **Tatton Tapestry** 27063, bay, bred by Earl Egerton of Tatton, Tatton Park, Cheshire; *s.* Royal William 2nd 12207, *d.* Tartan 13627 *by* Royal Sandy 3993.

322 **III.** (£5.)—LORD HOTHFIELD, Hothfield Place, Ashford, for **Xenia of Hothfield** 27322, brown; *s.* Insurgent 11668, *d.* Hothfield Renown 14955 *by* Bar None 2388.

---

[1] Gold Medal given by the Shire Horse Society for the best Shire Mare or Filly exhibited in Classes 46–49.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

318 **R. N. & H. C.**—CAPT. W. H. O. DUNCOMBE, Waresley Park, Sandy, for **Kingsbury Violet.**

H. C.—EARL EGERTON OF TATTON, for No. 319, **Tatton Godiva**; JOHN PARNELL, for No. 328, **Rokeby Judith.**

Com.—F. S. W. CORNWALLIS, M.P., for No. 316, **Miss Trustee**; FRED CRISP, for No. 317, **Saxon Sunbeam.**

Class 49.—*Shire Fillies, foaled in* 1898. [17 entries, 7 absent.]

340 **I. (£15.)**—SIR J. BLUNDELL MAPLE, BART., M.P., Childwick, St. Albans, for **Saxon Talent**, bay, bred by Sir Walter Gilbey, Bt., Elsenham Hall, Essex; *s.* Marmion 2nd 9885, *d.* Whitstone Talent 17610 *by* First Lord 7235.

346 **II. (£10.)**—LORD ROTHSCHILD, Tring Park, Herts., for **Fairy Queen**, grey; *s.* Paxton 4604, *d.* Fairy Tale 4892 *by* Aladdin 2969.

342 **III. (£5.)**—P. ALBERT MUNTZ, M.P., Dunsmore, Rugby, for **Dunsmore June Rose**, black; *s.* Harold 3703, *d.* Dunsmore Fleur-de-lis 19862 *by* Dunsmore Willington Boy 13021.

345 **R. N. & H. C.**—JOHN PARNELL, Rainsbrook, Rugby, for **Rokeby Venus.**

H. C.—H.R.H. THE PRINCE OF WALES, K.G., for No. 331, **Barrow Heiress**; J. P. CROSS, for No. 333, **Catthorpe Brenda**; WALPOLE GREENWELL, for No. 337, **Nailstone Royal Lass.**

Clydesdales.

Class 50.—*Clydesdale Stallions, foaled in* 1896. [2 entries, 1 absent.]

348 **I. (£15.)**—D. B. GIBSON, Ashley Manor, Brading, Isle of Wight, for **Aleska** 10489, black, bred by R. C. Macfarlane, Greenburn, Doune; *s.* Sir Everard 5353, *d.* Lady Seton 8754 *by* St. Lawrence 3220.

Class 51.—*Clydesdale Stallions, foaled in* 1897. [3 entries, none absent.]

350 **I. (£15.)**—H.M. THE QUEEN, Prince Consort's Shaw Farm, Windsor, for **Bentinck** 10505, bay; *s.* Prince Shapely 10111, *d.* Borgue Honey 12698 *by* Macgregor 1487.

351 **II. (£10.)**—A. & W. MONTGOMERY, Netherhall and Banks, Kirkcudbright, for **Ascot** 10494, brown, bred by William Hood, Chapelton, Kirkcudbright; *s.* Macgregor 1487, *d.* Princess 6269 *by* Prince of Wales 673.

Class 52.—*Clydesdale Stallions, foaled in* 1898. [4 entries, none absent.]

355 **I. (£15.)**—A. & W. MONTGOMERY, Netherhall and Banks, Kirkcudbright, for bay, bred by William Hood, Chapelton, Kirkcudbright; *s.* Baron's Pride 9122, *d.* Sally Walker 11815 *by* Prince Lawrence.

353 **II. (£10.)**—LADY ARTHUR CECIL, Orchardmains, Tonbridge, for bay; *s.* Claymore 3522, *d.* Kitty of Kirkcudbright 13382 *by* MacMeekan 9600.

354 **R. N. & H. C.**—THE MARQUIS OF LONDONDERRY, K.G., Seaham Hall, Seaham Harbour, for bay; *s.* Lord Stewart, *d.* Louisa.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 53.—*Clydesdale Mares (with Foals at foot).* [6 entries, 2 absent.]

362 I. (£15.)—HERBERT WEBSTER, Morton House, Fence Houses, co. Durham, for **Lady Lothian** 13319, brown, foaled 1893 [foal *by* Prince Thomas 10262], bred by Richard Little, Wormanby, Carlisle; *s.* Lord Lothian 5998, *d.* Nancy of Wormanby *by* Prince Henry 1257.

360 II. (£10.)—THE MARQUIS OF LONDONDERRY, K.G., Seaham Hall, Seaham Harbour, co. Durham, for **Essence**, brown, foaled 1895 [foal *by* Lord Stewart, 10084, bred by J. M'Coll, Mid-Walkinshaw, Renfrew; *s.* Sir Everard 5353, *d.* Marion of Walkinshaw 13153 *by* Macbrayne 4553.

358 R. N. & H. C.—LORDS A. AND L. CECIL, Orchardmains, Tonbridge, for **Fickle Fortune Princess.**

Class 54.—*Clydesdale Fillies, foaled in* 1896. [4 entries, 1 absent.]

366 I. (£15.)—HERBERT WEBSTER, Morton House, Fence Houses, co. Durham, for **Lady Victoria**, bay, bred by William Nicholson, Bombie, Kirkcudbright; *s.* Baron's Pride 9122, *d.* Kate of Bombie 13220 *by* Macgregor 1487.

364 II. (£10.)—LORDS A. AND L. CECIL, Orchardmains, Tonbridge, for **Lady Harry**, brown, bred by James Woof, Great Strickland, Penrith; *s.* Sir Harry 9411, *d. by* Curiosity 4320.

Class 55.—*Clydesdale Fillies, foaled in* 1897. [4 entries, none absent.]

369 I. (£15.)—J. B. G. TOTTIE, Coniston Cold, Bell Busk, Leeds, for **Cinderella**, black; *s.* Prince of Carruchan 8151, *d.* Grace Darling 13639 *by* Top Knot 6360.

368 II. (£10.)—THOMAS SMITH, Blacon Point, Chester, for **Jubilee Fashion**, bay; *s.* Montrave Kenneth 9622, *d.* Belle of Fashion 12924 *by* Prince of Fashion.

370 R. N. & H. C.—W. M. WOOD, Purston Hall, Pontefract, for **Jubilee Jewel.**

Class 56.—*Clydesdale Fillies, foaled in* 1898.[1] [4 entries, none absent.]

371 I. (£15.)—LORDS A. AND L. CECIL, Orchardmains, Tonbridge, for **Baroness Montagu**, bay, bred by William Hood, Chapelton, Kirkcudbright; *s.* Baron's Pride 9122, *d.* Hermione 12504 *by* Prince Romeo 8144.

374 II. (£10.)—THOMAS SMITH, Blacon Point, Chester, for **Village Beauty**, brown; *s.* Prince Pleasing 10259, *d.* Baroness 13609 *by* The Summit 9442.

373 R. N. & H. C.—THE MARQUIS OF LONDONDERRY, K.G., Seaham Hall, Seaham Harbour, for bay; *s.* Lord Stewart, *d.* British Queen.

Suffolks.

Class 57.—*Suffolk Stallions, foaled in* 1896. [5 entries, none absent.]

378 I. (£15.)—ALFRED J. SMITH, Rendlesham, Woodbridge, for **Saturn** 2653, chestnut; *s.* Wedgewood 1749, *d.* Stella 2427 *by* Cupbearer 3rd 566.

---

[1] Prizes given by the Maidstone Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

375 **II.** (£10.)—C. H. CORDY, Walton, Ipswich, for **Homocea** 2643, chestnut, bred by H. Showell, Hasketon, Woodbridge; *s.* Eclipse 2627, *d.* Dainty Dolly 3009 *by* Wedgewood 1749.

379 **III.** (£5.)—A. H. E. WOOD, Sudbourn Hall, Wickham Market, for **Lord Windsor** 2696, chestnut, bred by J. A. Hempson, Erwarton Hall, Ipswich; *s.* Windsor Chieftain 2025, *d.* Hester 1986 *by* Champion 1510.

377 **R. N.**—ALFRED J. SMITH, for **Captain B.**

Class 58.—*Suffolk Stallions, foaled in* 1897. [7 entries, 1 absent.]

384 **I.** (£15.)—ALFRED J. SMITH, Rendlesham, Woodbridge, for **Rendlesham Cupbearer** 2731, chestnut, bred by the Trustees of the Duke of Hamilton, Easton Park, Wickham Market; *s.* Eclipse 2627, *d.* Nectar 2953 *by* Emperor 1611.

383 **II.** (£10.)—SIR CUTHBERT QUILTER, BT., M.P., Bawdsey Manor, Woodbridge, for **Bawdsey Willie** 2725, chestnut; *s.* Prince Wedgewood 2364, *d.* Bawdsey Dolly 3611 *by* Czar 1754.

386 **III.** (£5.)—A. H. E. WOOD, Sudbourn Hall, Wickham Market, for **Bawdsey Brownie** 2732, chestnut, bred by Sir Cuthbert Quilter, Bt., M.P., Bawdsey Manor, Woodbridge; *s.* Prince Wedgewood 2364, *d.* Sprite *by* Checkmate 1566.

381 **R. N. & Com.**—PRATT & SON, Melton, Woodbridge, for **Foxboro' Captain.**

Class 59.—*Suffolk Stallions, foaled in* 1898. [6 entries, 2 absent.]

392 **I.** (£15.)—A. H. E. WOOD, Sudbourn Hall, Wickham Market, for **Sudbourn Spark**, chestnut, bred by Wm. Wilson, Raydon, Orford, Wickham Market; *s.* Lowestoft 1999, *d.* Margie 3343 *by* Wonder 2241.

388 **II.** (£10.)—EDWARD PACKARD, JUN., Bramford, Ipswich, for **Fashoda** 2755, chestnut; *s.* Eclipse 2010, *d.* Pepita 3423 *by* Wedgewood 1749.

389 **III.** (£5.)—EDWARD F. QUILTER, Hill House, Belstead, Ipswich, for **Bentley Luck** 2775, chestnut, bred by A. J. Smith, Rendlesham, Woodbridge; *s.* Prince Albert 2525, *d.* Westwood Luck 3302 *by* Westwood 2151.

391 **R. N.**—A. H. E. WOOD, for **Marquis of Salisbury.**

Class 60.—*Suffolk Mares (with Foals at foot).* [9 entries, 3 absent.]

395 **I.** (£15.)—SIR CUTHBERT QUILTER, BT., M.P., Bawdsey Manor, Woodbridge, for **The Lady** 3297, chestnut, foaled 1892 [foal *by* Prince Wedgewood 2364], bred by Horace Wolton, Newbourn, Woodbridge; *s.* Warrior 1938, *d.* Diadem's Empress 1977 *by* Diadem 1553.

399 **II.** (£10.)—R. HOLMES WHITE, Boulge Hall, Woodbridge, for **Nectar** 4177, chestnut, foaled 1890 [foal *by* Golden Grain 2479], bred by S. Toller, Letheringham, Wickham Market; *s.* Emperor 1611, *d.* Duchess 928 *by* Prince Imperial 1239.

398 **III.** (£5.)—ALFRED J. SMITH, Rendlesham, Woodbridge, for **Stella** 2427, chestnut, foaled 1888 [foal *by* Prince Albert 2525], bred by C. Kersey's Exors., Framsden Hall, Stonham; *s.* Cupbearer 3rd 566, *d.* Brandy *by* Champion 51.

393 **R. N. & H. C.**—W. BYFORD, The Court, Glemsford, for **Court Pride.**
394 **H. C.**—SIR CUTHBERT QUILTER, BT., M.P., for **Butley Lass.**
400 **Com.**—A. H. E. WOOD, Wickham Market, for **Sudbourn Dapper Maid.**

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 61.—*Suffolk Fillies, foaled in* 1896. [7 entries, 2 absent.]

404 I. (£15.)—SIR CUTHBERT QUILTER, BT., M.P., Bawdsey Manor, Woodbridge, for **Bawdsey Pearl** 4012, chestnut; *s.* Prince Wedgewood 2364, *d.* Bawdsey Diamond 3529 *by* Chieftain 1354.

408 II. (£10.)—A. H. E. WOOD, Sudbourn Hall, Wickham Market, for **Sudbourn Matchet** 4349, chestnut, bred by David Burrows, Dallinghoo, Wickham Market; *s.* Eclipse 2627, *d.* Scott 2245 *by* Chieftain 1354.

405 III. (£5.)—SIR CUTHBERT QUILTER, BT., M.P., for **Woolpit Lass** 4109, chestnut, bred by H. Scotchmer, The Grange, Woolpit; *s.* Worcester 2279, *d.* Smart 778 *by* Monarch 1056.

406 R. N. & H. C.—A. H. E. WOOD, for **Sudbourn Depper.**

Class 62.—*Suffolk Fillies, foaled in* 1897. [8 entries, 4 absent.]

416 I. (£15.)—A. H. E. WOOD, Sudbourn Hall, Wickham Market, for **Sudbourn Queen of Diamonds** 4348, chestnut, bred by the Trustees of the Duke of Hamilton, Easton Park, Wickham Market; *s.* Eclipse 2627, *d.* Queen of Trumps 2702 *by* Cupbearer 3rd 566.

410 II. (£10.)—WILLIAM R. HUSTLER, Earls Hall, Cockfield, Bury St. Edmunds, for **Countess** 4263, chestnut; *s.* Count Corby 2510, *d.* Good Girl 1178 *by* Nelson 901.

413 III. (£5.)—EDWARD F. QUILTER, Hill House, Belstead, Ipswich, for **Bentley Duchess** 4129, chestnut, bred by Samuel Stanford, Laxfield, Framlingham; *s.* Border Minstrel 2287, *d.* Laxfield Diamond 1423 *by* Wantisden Duke 534.

415 R. N. & Com.—JOHN SYMONDS, Thistleton Hall, Burgh, Woodbridge, for **Diamond Jubilee.**

Agricultural Horses.

Class 63.—*Agricultural Geldings, foaled in* 1895.[1] [4 entries, 1 absent.]

417 I. (£15.)—J. & T. C. ROBERTSON, Manor Farm, Cliffe, Rochester, for **Scotland Yet**, bay; *s.* Scalford Hero, *d.* Bonny *by* Drayman.

420 II. (£10.)—A. H. E. WOOD, Sudbourn Hall, Wickham Market, for **Wallace**, chestnut, bred at the Colonial College, Hollesley Bay; *s.* Wedgewood 1749.

418 III. (£5.)—A. H. E. WOOD, for **Boxer**, chestnut, bred by W. E. Long, Hurts Hall, Saxmundham; *s.* Queen's Diadem 1721.

Class 64.—*Agricultural Geldings, foaled in* 1896.[1] [4 entries.]

421 I. (£15.)—A. B. MATTHEWS, British Linen Bank, Newton Stewart, N.B., for **Gladiator**, bay, bred by H. A. Campbell, Penninghame House, Newton Stewart; *s.* Prince of Carruchan 8151, *d. by* Flashwood 3604.

422 II. (£10.)—LORD WANTAGE, K.C.B., V.C., Lockinge, Wantage, Berks, for **Farmer**, brown, bred by Mrs. Lowrie, Raydr Farm, Cardiff; *s.* Trentside 2nd 8483, *d.* Bright *by* Field Marshal 3087.

424 III. (£5.)—W. M. WOOD, Purston Hall, Pontefract, Yorks, for **Sherrie**, bay, bred by J. and T. Nichol, Abbey Town, Cumberland; *s.* Forest Hero 9529, *d.* Diamond 12594 *by* Gartsherrie 2800.

423 R. N.—A. H. E. WOOD, Sudbourne Hall, Wickham Market, for **Farnham.**

---

[1] Prizes given by the Maidstone Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

CATTLE.

Shorthorns.

Class 65.—*Shorthorn Bulls, calved in* 1894, 1895, *or* 1896. [21 entries, 3 absent.]

442 I. (£15.)—RICHARD STRATTON, The Duffryn, Newport, Mon., for **Alto** 68147, roan, born May 11, 1895; *s.* Excelsior 65466, *d.* Timbrel 5th *by* Roan Seal 43905.

425 II. (£10.)—H.R.H. THE PRINCE OF WALES, K.G., Sandringham, Norfolk, for **Stephanos** 71688, roan, born Jan. 2, 1896, bred by Her Majesty the Queen, Windsor; *s.* Fairfax 60792, *d.* Seclusion *by* Gael 60855.

444 III. (£5.)—SIR JACOB WILSON, Chillingham Barns, Belford, for **Sir Lawrence Riby** 67926, roan, born Sept. 19, 1894, bred by the Exors. of T. C. Booth, Warlaby, Northallerton; *s.* Sir Cuthbert Studley 64838, *d.* Lady Ruth Studley *by* Royal Stuart 40646.

443 R. N. & H. C.—J. DEANE WILLIS, Bapton, Codford, Wilts, for **Bapton Victory.**

H. C.—SIR JOHN GILMOUR, BT., for No. 431, **Brave Archer**; JOHN HANDLEY, for No. 433, **Lord James Douglas**; GEORGE HARRISON, for No. 436, **Lieutenant.**

Class 66.—*Shorthorn Bulls, calved in* 1897. [23 entries, 8 absent.]

455 I. (£15, & R. N. for Champion.[1]) GEORGE HARRISON, Gainford Hall, Darlington, for **Count Beauty** 72267, roan, born Jan. 15, bred by W. Duthie, Collynie, Tarves, N.B.; *s.* Golden Count 68711, *d.* Beauty 20th *by* Morton 53330.

460 II. (£10.)—DONALD MACLENNAN, 42 Sackville Street, Piccadilly, W., for **Estimation** 72487, red and little white, born June 21, bred by W. Atkinson, Overthwaite, Milnthorpe; *s.* Matchmaker 69105, *d.* Emblem *by* Ruling Star 58098.

446 III. (£5.)—H.M. THE QUEEN, The Prince Consort's Shaw Farm, Windsor, for **Matchless** 73031, red and little white, born Feb. 13; *s.* Captain of the Guard 58596, *d.* Maid of Denmark 3rd *by* Dauntless 54155.

466 R. N. & H. C.—ROBERT TAYLOR, Pitlivie Farm, Carnoustie, N.B., for **Merry Merlin.**

H. C.—HENRY DUDDING, for No. 452, **Pride of Fortune**; W. J. HOSKEN, for No. 457, **Jubilee Prince**; THOMAS WINTER, for No. 468, **Waterloo Grand Duke.**

447 Com.—RICHARD BOOTH, for **Sir Rupert Riby.**

Class 67.—*Shorthorn Bulls, calved in* 1898. [22 entries, 9 absent.]

489 I. (£15, & Champion.[1])—J. DEANE WILLIS, Bapton Manor, Codford, Wilts, for **Bapton Emperor**, roan, born March 10; *s.* Ingram Yet 70652, *d.* Cicely (vol. xli. p. 678) *by* Roan Robin 57992.

470 II. (£10.)—H.M. THE QUEEN, The Prince Consort's Shaw Farm, Windsor, for **Royal Duke**, roan, born March 17; *s.* Prince Victor 73320, *d.* Rosewater (vol. xliv. p. 271) *by* Red Rover 63192.

490 III. (£5.)—J. DEANE WILLIS, Codford, for **Royal Jeweller**, roan, born March 2, bred by C. W. Brierley, Twyford, Brimfield R.S.O.; *s.* Royal Secret, *d.* Jewel 2nd (vol. xliii. p. 337) *by* Rosedale George 63235.

[1] Champion Prize of £20, given by the Shorthorn Society for the best Shorthorn Bull exhibited in Classes 65–67.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

474 **R. N. & H. C.**—D. ABBOTT GREEN, Fingringhoe Hall, Colchester, for **Lavender Yet.**

H. C.—GEORGE HARRISON, for No. 476, **Favourite of Sanquhar**; LORD MIDDLETON, for No. 484, **Linguist.**

Class 68.—*Shorthorn Cows (in-milk or in-calf), calved before or in* 1895. [8 entries, 1 absent.]

491 **I.** (£15.)—MISS ALICE DE ROTHSCHILD, Waddesdon Manor, Aylesbury, for **Miss Belladrum 6th** (vol. xliv. p. 399), red and little white, born Nov. 18, 1893, in-milk, calved April 4, 1898, and in-calf, bred by Lord Lovat, Beaufort Castle, Beauly, N.B.; *s.* Lord Violet 56103, *d.* Miss Belladrum *by* Belladrum 42777.

494 **II.** (£10.)—WILLIAM J. HOSKEN, Loggans Mill, Hayle, Cornwall, for **Countess of Oxford 14th** (vol. xli. p. 431), red, born Aug. 10, 1894, in-milk, calved Jan. 1, 1899; *s.* Fireball 64025, *d.* Countess of Oxford 13th *by* Duke of Tregunter 10th 54224.

493 **III.** (£5.)—GEORGE HARRISON, Gainford Hall, Darlington, for **Welcome** (vol. xlii. p. 440), roan, born Sept. 30, 1895, in-milk, calved Sept. 24, 1898, and in-calf; *s.* Champion Cup 65240, *d.* Warfare *by* First Consul 57314.

497 **R. N.**—LORD POLWARTH, Mertoun House, St. Boswell's, N.B., for **Lady Beatrice.**

Class 69.—*Shorthorn Heifers (in-milk or in-calf), calved in* 1896. [7 entries, 2 absent.]

501 **I.** (£15.)—LEOPOLD DE ROTHSCHILD, Ascott, Leighton Buzzard, for **Mayflower 4th**, roan, born Jan. 13, in-milk, calved Jan. 1, 1899, bred by R. Turner, Cairnton of Boyndie, Portsoy, N.B.; *s.* President 67611, *d.* May Flower (vol. xxxvii. p. 525) *by* Eastern Star 58881.

504 **II.** (£10.)—WILLIAM J. HOSKEN, Loggans Mill, Hayle, Cornwall, for **Wood Rose 2nd** (vol. xliii. p. 498), roan, born April 27, in-milk, calved Feb. 25, 1899, bred by M. H. Williams, Pencalenick, Truro; *s.* Bridekirk Boy 2nd 66730, *d.* Wood Rose *by* Wild Duke of Geneva 24th 53859.

500 **III.** (£5.)—MISS ALICE DE ROTHSCHILD, Waddesdon Manor, Aylesbury, for **Signet** (vol. xliii. p. 403), roan, born June 9, in-milk, calved Jan. 6, 1899, bred by Baron F. J. de Rothschild, Waddesdon Manor; *s.* Cash 65230, *d.* Silvia *by* New Year's Gift 57796.

Class 70.—*Shorthorn Heifers, calved in* 1897. [22 entries, 10 absent.]

524 **I.** (£15, **& R. N. for Champion.**[1])—J. DEANE WILLIS, Bapton Manor, Codford, Wilts, for **Bapton Pearl**, roan, born April 16; *s.* Count Lavender 60545, *d.* Primrose 2nd (vol. xliii. p. 749) *by* Golden Crown 54370.

513 **II.** (£10.)—WILLIAM HEATON, Lostock Junction, Bolton, for **Daisy 4th** (vol. xliv. p. 318), roan, born Jan. 1, bred by J. W. Barnes, Aikbank, Wigton; *s.* Prince Victor 69321, *d.* Daisy *by* Crown Prince 60564.

523 **III.** (£5.)—J. DEANE WILLIS, Bapton Manor, for **Bapton Fluff**, roan, born Feb. 18; *s.* Count Lavender 60545, *d.* Wiltshire Daisy (vol. xli. p. 682) *by* Rising Star 54920.

---

[1] Champion Prize of £20, given by the Shorthorn Society for the best Shorthorn Cow or Heifer exhibited in Classes 68-71.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

517 R. N. & H. C.—LORD MIDDLETON, Birdsall House, York, for **Waterloo 40th.**

H. C.—H. M. THE QUEEN, for No. 506, **Feodora**; LEOPOLD DE ROTHSCHILD, for No. 508, **White Socks**; JOSEPH HARRIS, for No. 511, **Empress 12th.**

512 Com.—GEORGE HARRISON, for **Fairy Queen.**

Class 71.—*Shorthorn Heifers, calved in* 1898. [25 entries, 11 absent.]

528 I. (£15, & Champion.[1])—H. M. THE QUEEN, The Prince Consort's Shaw Farm, Windsor, for **Cicely**, roan, born Feb. 21; *s.* Prince Victor 73320, *d.* Christobel (vol. xliv. p. 269) *by* Crœsus 58706.

549 II. (£10.)—J. THORLEY, Ringdale House, Faringdon, for **Ringdale Memory 3rd**, roan, born Jan. 23; *s.* Viator 71769, *d.* Ringdale Memory (vol. xlii. p. 680) *by* Dictator 63870.

535 III. (£5.)—R. & W. T. GARNE, Aldsworth, Northleach, for **Aldsworth Jewel**, roan, born Jan. 24; *s.* Now or Never 67544, *d.* Rosedale Jewel (vol. xlii. p. 296) *by* Martinet 59455.

539 R. N. & H. C.—GEORGE HARRISON, Gainford Hall, Darlington, for **Sweet Adelaide.**

H. C.—J. HARRIS, for No. 537, **Pansy 2nd**; J. THORLEY, for No. 550, **Ringdale Nonpareil 2nd**; T. WINTER, for No. 552, **Play Girl.**

Herefords.

Class 72.—*Hereford Bulls, calved in* 1894, 1895, *or* 1896. [5 entries, 1 absent.]

556 I. (£15.)—EDGAR WIGHT, Tedstone Court, Worcester, for **Tedstone President** 18631, born Feb. 26, 1895, bred by Sir C. R. Boughton, Bt., Downton Hall, Ludlow; *s.* Royalist 3rd 16958, *d.* Cora *by* Sovereign 12668.

557 II. (£10.)—EDWARD YELD, Endale, Leominster, for **Iron King** 18884, born Feb. 14, 1896, bred by Mrs. M. J. Heygate, Buckland, Leominster; *s.* Iron Master 17318, *d.* Clythe *by* Prairie Star 15577.

555 III. (£5.)—A. E. HILL & E. J. LEWIS, Egleton Court, Ledbury, for **Newdigate** 18498, born Jan. 25, 1895, bred by J. H. Arkwright, Hampton Court, Leominster; *s.* Pearl Cross 16882, *d.* Lively 18th *by* Hilarity 8734.

554 R. N. & H. C.—W. H. DAVIES, Liver's Ocle, Hereford, for **Sir Pearce.**

Class 73.—*Hereford Bulls, calved in* 1897. [10 entries, 5 absent.]

558 I. (£15.)—H. M. THE QUEEN, Flemish Farm, Windsor, for **Dictator**, born Jan. 15; *s.* Ladas 17919, *d.* Daylight (vol. xxviii. p. 150) *by* Monarch 7858.

560 II. (£10.)—THE EARL OF COVENTRY, Croome Court, Severn Stoke, for **Miser**, Worcs., born Feb. 19; *s.* Viscount 18648, *d.* Miss Minstrel 2nd (vol. xxvii. p. 224) *by* Royal Ruler 13406.

559 III. (£5.)—THE EARL OF COVENTRY, Croome Court, for **Miscreant**, born Jan. 26; *s.* Viscount 18648, *d.* Misdeal 2nd (vol. xxvii. p. 223) *by* Good Boy 7668.

566 R. N. & H. C.—E. J. WYTHES, for **Copped Hall Premier.**

565 Com.—EDGAR WIGHT, Tedstone Court, Worcester, for **Tedstone Sirdar.**

---

[1] Champion Prize of £20, given by the Shorthorn Society for the best Cow or Heifer exhibited in Classes 68–71.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 74.—*Hereford Bulls, calved in* 1898. [15 entries, 1 absent.]

576 **I.** (£15.)—ALLEN E. HUGHES, Wintercott, Leominster, for **Prosperous**, born Jan. 11; *s.* Albion 15027, *d.* Newtown Plum (vol. xxviii. p. 436) *by* Rudolph 6660.

578 **II.** (£10.)—H. W. TAYLOR, Showle Court, Ledbury, for **Sorcerer**, born Feb. 23, bred by A. P. Turner, The Leen, Pembridge; *s.* Clarence 15944, *d.* Speedwell (vol. xxviii. p. 710) *by* Statesman 14938.

575 **III.** (£5.)—RICHARD GREEN, The Whittern, Kington, Herefordshire, for **Maximilian**, born Jan. 6; *s.* Diplomat 18328, *d.* Merry Maid (vol. xxviii. p. 370) *by* Whittern Grove 10843.

568 **R. N. & H. C.**—H.M. THE QUEEN, Flemish Farm, Windsor, for **Sir Wilfrid.**

H. C.—S. H. ARMITAGE, for No. 569, **Dumbleton**; R. GREEN, for No. 574, **Climax**; W. TUDGE, for No. 579, **Goldsmith**; A. P. TURNER, for No. 580, **Marcus.**

Com.—THE EARL OF COVENTRY, for Nos. 570, **Chaucer**, and 572, **Metallician**; E. J. WYTHES, for No. 581, **Copped Hall Silurian**; E. YELD, for No. 582, **Commerce.**

Class 75.—*Hereford Cows (in-milk or in-calf), calved before or in* 1895. [4 entries.]

583 **I.** (£10.)—H.M. THE QUEEN, Flemish Farm, Windsor, for **Truthful** (vol. xxviii. p. 152), born Jan. 9, 1890, in-milk, calved March 13, 1899; *s.* Trajan 8117, *d.* Turquoise *by* Hotspur 7028.

586 **II.** (£5.)—JOHN TUDGE, Duxmoor, Craven Arms, for **Rubella** (vol. xxviii. p. 699), born June 26, 1891, in-milk, calved April 17, 1899; *s.* Hartington 5358, *d.* Ruthella *by* Coral King 12027.

584 **R. N. & H. C.**—RICHARD GREEN, The Whittern, Kington, for **Cedar.**

585 **H. C.**—JOHN TUDGE, for **Dora.**

Class 76.—*Hereford Heifers (in-milk or in-calf), calved in* 1896. [2 entries.]

588 **I.** (£10.)—ALLEN E. HUGHES, Wintercott, Leominster, for **Wintercott Plum** (vol. xxviii. p. 436), born Jan. 29, in-milk, calved Feb. 8, 1899; *s.* Albion 15027, *d.* Newtown Plum *by* Rudolph 6660.

587 **II.** (£5.)—RICHARD GREEN, The Whittern, Kington, Herefordshire, for **Ixia** (vol. xxviii. p. 369), born Jan. 29, in-milk, calved Jan. 11, 1899; *s.* Gentle Boy 16074, *d.* Ivy *by* Druid 5880.

Class 77.—*Hereford Heifers, calved in* 1897. [8 entries, 2 absent.]

596 **I.** (£15.)—WM. TUDGE, Leinthall, Ludlow, for **Leinthall Beauty** (vol. xxix. p. 612), born Jan. 11; *s.* Rupert 16366, *d.* Barbara *by* Ancient Briton 15034.

594 **II.** (£10.)—JOHN TUDGE, Duxmoor, Craven Arms, for **Lady Duxmoor** (vol. xxix. p. 611), born March 12; *s.* Lord Lulham 13937, *d.* Rubella *by* Hartington 5358.

591 **III.** (£5.)—ALLEN E. HUGHES, Wintercott, Leominster, for **Ladylove** (vol. xxix. p. 390), born Jan. 14; *s.* Albion 15027, *d.* Lofty 2nd *by* Seabreeze 14153.

590 **R. N. & H. C.**—W. H. DAVIES, Liver's Ocle, Hereford, for **Patience.**

595 **H. C.**—JOHN TUDGE, for **Wilton Star.**

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 78.—*Hereford Heifers, calved in* 1898. [13 entries, 5 absent.]

603 I. (£15.)—RICHARD GREEN, The Whittern, Kington, Herefordshire, for **Lady Help**, born Feb. 5; *s.* Diplomat 18328, *d.* Lady Helen (vol. xxviii. p. 369) *by* Pioneer 16269.

600 II. (£10.)—DAVID EVANS, Ffrwdgrech, Brecon, for **Friend 2nd**, born Jan. 28; *s.* Titus 17577, *d.* Friend (vol. xxvii. p. 265) *by* Blucher 2nd 18246.

597 III. (£5.)—H.M. THE QUEEN, Flemish Farm, Windsor, for **Sapphire**, born Jan. 10; *s.* Ladas 17919, *d.* Silk (vol. xxviii. p. 587) *by* Pioneer 14025.

608 R. N. & H. C.—WM. TUDGE, Leinthall, Ludlow, for **New Year's Gift.**

H. C.—S. H. ARMITAGE, for No. 598, **Likely**; T. FENN, for No. 601, **Downton Butterfly**; RALPH PALMER, for No. 606, **Sweet Pea.**

599 Com.—DAVID EVANS, for **Barmaid 2nd.**

Devons.

Class 79.—*Devon Bulls, calved in* 1894, 1895, *or* 1896. [7 entries, 2 absent.]

610 I. (£15.)—THE HON. CLAUD B. PORTMAN, Child Okeford, Blandford, for **Middling Character** 3630, born June 21, 1894, bred by Sir W. R. Williams, Bt., Upcott, Barnstaple; *s.* Pretty Middling 2859, *d.* Fancy 6th 11887 *by* Captain 2204.

611 II. (£10.)—THE HON. E. W. B. PORTMAN, Hestercombe, Taunton, for **Duke of Pound 29th** 3725, born Jan. 28, 1896, bred by A. C. Skinner, Pound Farm, Bishop's Lydeard; *s.* Masterpiece 2837, *d.* Duchess 35th 13075 *by* Lord Wolseley 2063.

616 III. (£5.)—SIR W. R. WILLIAMS, BT., Upcott, Barnstaple, for **Robert George** 3801, born June 14, 1896; *s.* Pretty Middling 2nd 3172, *d.* Fiction 3rd 11889 *by* Captain 2204.

615 R. N. & H. C.—J. C. WILLIAMS, Caerhays Castle, St. Austell, for **Woodcock.**

613 Com.—RT. HON. SIR W. H. WALROND, BT., M.P., for **Royalist 2nd of Pound.**

Class 80.—*Devon Bulls, calved in* 1897 *or* 1898. [4 entries, none absent.]

619 I. (£15.)—E. J. STANLEY, M.P., Quantock Lodge, Bridgwater, for **Quantock Jubilee** 3943, born Jan. 11, 1897; *s.* Tregothnan 2902, *d.* Beauty 9th 12118 *by* Duke of Wellington 1955.

617 II. (£10.)—ALFRED BOWERMAN, Capton, Williton, Taunton, for **Sir Walter** 3959, born April 8, 1897; *s.* Lord Culverhay 3469, *d.* Apricot 13743 *by* Palmerston 2474.

618 R. N. & H. C.—THE HON. E. W. B. PORTMAN, Hestercombe, Taunton, for **Lord Passmore 9th of Pound.**

Class 81.—*Devon Cows (in-milk or in-calf), calved before or in* 1895. [5 entries, 2 absent.]

625 I. (£15.)—J. C. WILLIAMS, Caerhays Castle, St. Austell, for **Molly 5th**[1] 14885, born Feb. 13, 1895, in-calf; *s.* Captain 2204, *d.* Molly 7986 *by* Sir Watkin 1846.

[1] Subject to compliance with Regulation as to calving.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

621 II. (£10.)—ALFRED BOWERMAN, Capton, Williton, Taunton, for **Sally** 15571, born Jan. 10, 1895, in-milk, calved Dec. 5, 1898, and in-calf; *s.* Starlight 3514, *d.* Dolly 5th 9482 *by* Lord Ilbear 1779.

622 R. N. & H. C.—THE HON. E. W. B. PORTMAN, Hestercombe, Taunton, for **Handsome 3rd.**

Class 82.—*Devon Heifers (in-milk or in-calf), calved in* 1896. [6 entries.]

629 I. (£15.)—J. C. WILLIAMS, Caerhays Castle, St. Austell, for **Fickle** 16612, born July 18, in-milk, [calved July 23, 1899]; *s.* Cardsharper 3082, *d.* Fiction 5th 13191 *by* Pretty Middling 2859.

630 II. (£10.)—J. C. WILLIAMS, Caerhays Castle, for **Mirabel 3rd** 15510 born April 14, in-milk, calved Feb. 8, 1899; *s.* Afterthought 3375, *d.* Mirabel 2nd 13180 *by* Marmaduke 2280.

631 III. (£5.)—SIR W. R. WILLIAMS, BT., Upcott, Barnstaple, for **Fiction 6th**[1] 15518, born Jan. 1, in-calf; *s.* Pretty Middling 2nd 3172, *d.* Fiction 4th 12580 *by* Captain 2204.

626 R. N. & H. C.—ALFRED BOWERMAN, Capton, Williton, Taunton, for **Mustard.**

628 H. C.—E. J. STANLEY, M.P., for **Quantock Moss Rose 23rd.**

627 Com.—THE HON. E. W. B. PORTMAN, for **Myrtle 56th of Pound.**

Class 83.—*Devon Heifers, calved in* 1897. [7 entries, 2 absent.]

637 I. (£10.)—J. C. WILLIAMS, Caerhays Castle, St. Austell, for **Nessie 3rd** 16063, born Jan. 9; *s.* Afterthought 3375, *d.* Nessie 2nd 14292 *by* Cardsharper 3082.

636 II. (£5.)—J. C. WILLIAMS, Caerhays Castle, for **Diamond Necklet 8th** 16050, born March 8; *s.* Pretty Middling 2859, *d.* Diamond Necklet 3rd 12560 *by* Duke of Flitton 17th 1544.

632 R. N. & H. C.—H.M. THE QUEEN, Flemish Farm, Windsor, for **Pretty Pansy.**

633 H. C.—A. BOWERMAN, for **Mistletoe.**

634 Com.—THE HON. E. W. B. PORTMAN, for **Lowton.**

Class 84.—*Devon Heifers, calved in* 1898. [6 entries, none absent.]

642 I. (£10.)—E. J. STANLEY, M.P., Quantock Lodge, Bridgwater, for **Quantock Princess 8th** 16562, born March 29; *s.* Goodwill 3592, *d.* Quantock Princess 2nd 14810 *by* Duke of Bridgwater 3258.

644 II. (£5.)—SIR W. R. WILLIAMS, BT., Upcott, Barnstaple, for **Flower 7th** 16627, born March 2; *s.* Pretty Middling 2nd 3172, *d.* Flower 6th 14897 *by* Pretty Middling 2859.

640 R. N. & H. C.—A. BOWERMAN, Capton, Williton, Taunton, for **Lottie.**

643 H. C.—J. C. WILLIAMS, for **Waterlily 25th.**

Sussex.

Class 85.—*Sussex Bulls, calved in* 1894, 1895, *or* 1896. [6 entries.]

649 I. (£15.)—PHILIP SAILLARD, Buchan Hill, Crawley, for **Alfred** 1637, born April 13, 1896, bred by J. H. T. Broadwood, Lyne, Horsham; *s.* Vickress 1364, *d.* Curly 3rd 6481 *by* Hardy Boy 2nd 686.

---

[1] Subject to compliance with Regulation as to calving.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

646 II. (£10.)—THE EARL OF DERBY, K.G., Birtley, Witley, Godalming, for **Merchant** 1485, born June 6, 1896; *s.* Golden Rex 1303, *d.* Merry May 5854 *by* Billy Boy Blue 1081.

617 III. (£5.)—THE HON. RALPH P. NEVILL, The Manor, Birling, Maidstone, for **Gladsome Prince** 1370, born Feb. 3, 1894, bred by the Earl of Derby, K.G., Birtley, Witley, Godalming; *s.* Proud Prince 1249, *d.* Gladsome 3rd 4008 *by* Oxford 2nd 771.

650 R. N. & H. C.—THE EXORS. OF THE LATE F. WARDE, Aldon, Addington, West Malling, for **Aldon 2nd.**

Com.—F. S. W. CORNWALLIS, M.P., for No. 645, **Red Knight**; LORD NORTHBOURNE, for No. 648, **Odo.**

Class 86.—*Sussex Bulls, calved in* 1897. [8 entries, 3 absent.]

653 I. (£15.)—THE EARL OF DERBY, K.G., Birtley, Witley, Godalming, for **Diploma** 1540, born Jan. 13; *s.* Proud Prince 1249, *d.* Diadem 6178 *by* Gladiateur 1171.

652 II. (£10.)—F. S. W. CORNWALLIS, M.P., Linton Park, Maidstone, for **Lord Linton** 1537, born Feb. 14; *s.* Beacon 1247, *d.* Barbara 6194 *by* Churchwarden 1176.

656 R. N. & H. C.—THE HON. RALPH P. NEVILL, The Manor, Birling, Maidstone, for **Duke of Birling.**

Class 87.—*Sussex Bulls, calved in* 1898.[1] [14 entries, 2 absent.]

670 I. (£15.)—PHILIP SAILLARD, Buchan Hill, Crawley, for **Bewbush Knight 2nd** (vol. xiv. p. 89), born April 11; *s.* Young Goldfinch 1388, *d.* Carless E. 6 5864 *by* Otham 769.

667 II. (£10.)—THE HON. RALPH P. NEVILL, The Manor, Birling, Maidstone, for **Confidence 2nd** 1630, born Jan. 3; *s.* Confidence 1498, *d.* Lady Lyne 4507 *by* Papa 709.

664 III. (£5.)—THE EARL OF DERBY, K.G., Birtley, Witley, Godalming, for **Nero** 1615, born July 29; *s.* Proud Prince 1249, *d.* Noblesse 3078 *by* Drungewick 456.

666 R. N. & H. C.—LOUIS HUTH, Possingworth Manor, Waldron, Sussex, for **Broadgauge 4th.**

672 H. C.—EARL WINTERTON, Shillinglee Park, Petworth, for **Sarchedon.**

Com.—ERNEST E. BRABY, for No. 660, **Royal Drungewick**; F. S. W. CORNWALLIS, M.P., for No. 662, **His Lordship.**

Class 88.—*Sussex Cows (in-milk or in-calf), calved before or in* 1895. [9 entries, 2 absent.]

677 I. (£15.)—THE EARL OF DERBY, K.G., Birtley, Witley, Godalming, for **Minx** 6502, born May 9, 1894, in-milk, [calved Aug. 3, 1899]; *s.* Lord Oxeye of Wantly 1070, *d* Mirthful 4691 *by* Buffer 663.

681 I. (£10.)—PHILIP SAILLARD, Buchan Hill, Crawley, for **Elsa 2nd** 5732, born Jan. 20, 1892, in-milk, calved April 21, 1899, bred by W. B. Waterlow, High Trees, Redhill; *s.* Knight of Woodmancote 3rd 965, *d.* Elsa 3214 *by* Wallace 478.

---

[1] Prizes given by the Maidstone Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

676 III. (£5.)—F. S. W. CORNWALLIS, M.P., Linton Park, Maidstone, for **Mignon** 7215, born Dec. 3, 1895, in-milk, calved Feb. 11, 1899, bred by G. White, Buston, Hunton; *s.* Oxford Duke 1st 840, *d.* Hortense 6376 *by* Samson 935.

675 R. N. & H. C.—MAJOR BEST, Park House, Boxley, Maidstone, for **Queen Daisy**.

Class 89.—*Sussex Heifers, in-milk or in-calf, calved in* 1896.[1] [5 entries, 1 absent.]

685 I. (£15.)—GERALD WARDE, Tutsham Hall, West Farleigh, Maidstone, for **Tutsham Marguerite** 7202, born April 24, in-milk, calved Feb. 5, 1899, bred by C. J. Lucas, Warnham Court, Horsham; *s.* Lord Oxeye 2nd 1383, *d.* Linnet 5868 *by* Gondolier 1001.

686 II. (£10.)—GERALD WARDE, West Farleigh, for **Tutsham Twin 2nd** 7203, born June 4, in-milk, calved May 22, 1899; *s.* Rochester 1114, *d.* Twin D 3 6069 *by* Otham 769.

682 R. N.—F. S. W. CORNWALLIS, M.P., for **Princess Joan.**

Class 90.—*Sussex Heifers, calved in* 1897. [12 entries, 2 absent.]

691 I. (£15, & Champion.[2])—THE EARL OF DERBY, K.G., Birtley, Witley, Godalming, for **Bangle** 7343, born Feb. 4; *s.* Golden Rex 1303, *d.* Broad Bess 5032 *by* Court Wick 801.

696 II. (£10, & R. N. for Champion.[2])—THE EXORS. OF THE LATE FREDERICK WARDE, Aldon, Addington, West Malling, Kent, for **Aldon Jewel** 7478, born Jan. 4; *s.* Aldon 1st 1450, *d.* Aldon Prebble A 5 6055 *by* Stella's Oxford 651.

697 III. (£5.)—THE EXORS. OF THE LATE FREDERICK WARDE, for **Aldon Woodmancote 3rd** 7480, born Jan. 19; *s.* Goldfinch 1277, *d.* Aldon Woodmancote 1st 6668 *by* Headley 1201.

692 R. N. & H. C.—JOSEPH GODMAN, Park Hatch, Godalming, for **Bonfire 11th.**

H. C.—MAJOR BEST, for No. 689, **Boxley Cauliflower**; PHILIP SAILLARD, for No. 695, **Caution.**

Com.—CAPTAIN R. ALEXANDER, for No. 687, **Buckhurst Careless**; F. S. W. CORNWALLIS, M.P., for No. 690, **Daffodil**; EARL WINTERTON, for No. 698, **Sugarcane 2nd.**

Class 91.—*Sussex Heifers, calved in* 1898. [14 entries, none absent.]

711 I. (£15.)—THE EXORS. OF THE LATE FREDERICK WARDE, Aldon, Addington, West Malling, for **Alton P 3** 7813, born Feb. 11; *s.* Aldon 2nd 1451, *d.* Aldon Careless P 6051 *by* Redhill Gold-dust 927.

701 II. (£10.)—MAJOR BEST, Park House, Boxley, Maidstone, for **Grace Darling** 7558, born Feb. 6; *s.* Churchill 1373, *d.* Grandiflora 4627 *by* Frankfort 1st 811.

705 III. (£5.)—JOSEPH GODMAN, Park Hatch, Godalming, for **Bonfire 12th** 7612, born Jan. 29; *s.* Lord George Napier 1372, *d.* Bonfire 3rd 5503 *by* Oxford Duke 4th 1014.

700 R. N. & H. C.—MAJOR BEST, for **Boxley Cowslip.**

H. C.—MRS. ERNEST HILLS, for No. 706, **Penshurst Napier**; GERALD WARDE, for No. 712, **Tutsham Dulcimer 2nd.**

Com.—F. S. W. CORNWALLIS, M.P., for No. 703, **Eagle 4th**; W. W. HUBBLE, for No. 707, **Mona**; PHILIP SAILLARD, for No. 709, **Bewbush Marguerite.**

---

[1] Prizes given by the Maidstone Local Committee.

[2] Champion Prize of £10, given by the Sussex Herd Book Society for the best Sussex animal exhibited in Classes 85 to 91.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Longhorns.

Class 92.—*Longhorn Bulls of any age.* [3 entries.]

714 I. (£10.)—H. JASPER SELWYN, Little Woodcote, Kenilworth, for **Kenilworth**, brindle, born March 30, 1895, bred by W. H. Sale, Atherstone; *s.* Earl of Upton 10th, *d.* Plum *by* Peach.

715 II. (£5.)—H. JASPER SELWYN, Kenilworth, for **Wooton Wonder**, brindle, born Jan. 30, 1897; *s.* Pretender 2nd, *d.* Pink *by* Baddesley.

713 **R. N. & H. C.**—THE HON. E. A. FITZROY, Fox Hill, West Haddon, Rugby, for **Charles 2nd.**

Class 93.—*Longhorn Cows or Heifers, in-milk or in-calf.* [6 entries, 1 absent.]

718 I. (£10.)—W. HANSON SALE, Mancetter Cottage, Atherstone, for **Fradley Beauty**, brindle and white, born Jan. 5, 1893, in-milk, calved March 24, 1899, bred by W. S. Shaw, Fradley, Lichfield; *s.* The Duke, *d.* Flora *by* The Major.

719 II. (£5.)—W. HANSON SALE, Atherstone, for **Moss Rose**, red and white, born March 11, 1894, in-milk, calved Feb. 16, 1899; *s.* Rugby, *d.* Daisy *by* Rugby.

717 **R. N. & H. C.**—THE HON. E. A. FITZROY, Fox Hill, West Haddon, Rugby, for **Pride of Upton.**

721 **H. C.**—H. JASPER SELWYN, for **Melcombe Queen.**

720 **Com.**—H. JASPER SELWYN, for **Melcombe Duchess.**

Welsh.

Class 94.—*Welsh Bulls, calved in* 1894, 1895, *or* 1896. [4 entries, 1 absent.]

722 I. (£15.)—RICHARD M. GREAVES, Wern, Portmadoc, for **Bryntwr 395**, born Jan. 10, 1895; *s.* Ulundi 238, *d.* Gwernen Ddu 888 *by* Sir Watkin 2nd 126.

724 II. (£10.)—WILLIAM E. OAKELEY, The Plâs, Tan-y-Bwlch, Merionethshire, for **Hwfa 420**, born March 5, 1895; *s.* Evan 341, *d.* Mair 4th 969 *by* Latimer 188.

725 **R. N. & H. C.**—COLONEL HENRY PLATT, C.B., Gorddinog, Llanfairfechan, for **Rent Payer.**

Class 95.—*Welsh Bulls, calved in* 1897 *or* 1898. [2 entries.]

726 I. (£15.)—LORD HARLECH, Glyn, Talsarnau, Merionethshire, for **Sylfaen**, born Feb. 13, 1897; *s.* Llandecnyn 343, *d.* Lady Helen 475.

727 **R. N & H. C.**—W. E. OAKELEY, The Plâs, Tan-y-Bwlch, for **Gwydion.**

Class 96.—*Welsh Cows or Heifers (in-milk or in-calf), calved before or in* 1896. [4 entries, none absent.]

731 I. (£15.)—COLONEL HENRY PLATT, C.B., Gorddinog, Llanfairfechan, for **Queen of Spades 2nd** 1034, born Feb. 19, 1895, in-milk, calved Dec. 9, 1898; *s.* The Alderman 358, *d.* Queen of Spades 1033.

730 II. (£10.)—COLONEL HENRY PLATT, C.B., for **Kate 2nd** 1014, born Feb. 1, 1895, in-milk, calved Oct. 28, 1898; *s.* The Alderman 358, *d.* Kate 498.

729 **R. N. & H. C.**—WILLIAM E. OAKELEY, The Plâs, Tan-y-Bwlch, for **Pyrites.**

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 97.—*Welsh Heifers, calved in* 1897. [4 entries, none absent.]

734 I. (£10.)—COLONEL HENRY PLATT, C.B., Gorddinog, Llanfairfechan, for **Cambrian Princess 3rd** 1206, born Jan. 13; *s.* City Councillor 347, *d.* Cambrian Princess 995.

732 II. (£5.)—RICHARD M. GREAVES, Wern, Portmadoc, for **Tremadoc** 1135, born Jan. 3; *s.* Madoc Lad 311, *d.* Treflys.

735 R. N. & H. C.—COLONEL HENRY PLATT, C.B., for **Plâs Betty**.

Class 98.—*Welsh Heifers, calved in* 1898. [4 entries, none absent.]

737 I. (£10.)—WILLIAM E. OAKELEY, The Plâs, Tan-y-Bwlch, Merionethshire, for **Pyrites 2nd** 1190, born Jan. 3; *s.* Hwfa 420, *d.* Pyrites 973 *by* Ardudwy 255.

736 II. (£5.)—RICHARD M. GREAVES, Wern, Portmadoc, for **Brynywern**, born Jan. 7; *s.* Bryntwr 395, *d.* Garregbach *by* Brenin Morfa 233.

739 R. N. & H. C.—COLONEL HENRY PLATT, C.B., for **Madryn Queen**.

Red Polled.

Class 99.—*Red Polled Bulls, calved in* 1894, 1895, *or* 1896. [6 entries, 2 absent.]

742 I. (£15, & Champion.[1])—R. HARVEY MASON, Necton Hall, Swaffham, Norfolk, for **Magician** 5021, born June 3, 1896; *s.* Majiolini 3600, *d.* Mempris 9562 *by* Paris 1974.

740 II. (£10.)—LORD AMHERST OF HACKNEY, Didlington Hall, Brandon, Norfolk, for **Castor** 4294, born Jan. 5, 1895; *s.* Caister Spark 3413, *d.* Emerald 2nd 8501 *by* Didlington Davyson 2nd 657.

743 III. (£5.)—JAMES E. PLATT, Bruntwood, Cheadle, for **Able Risky** 4722, born Feb. 21, 1896, bred by George Gooderham, Monewden, Wickham Market; *s.* Able Use 3360, *d.* Sunny Risky 6010 *by* Sunflower 1309.

741 R. N.—LORDS ARTHUR AND LIONEL CECIL, Orchardmains, Tonbridge, for **Dan**.

Class 100.—*Red Polled Bulls, calved in* 1897 *or* 1898. [7 entries, 1 absent.]

748 I. (£15, & R. N. for Champion.[1])—FREDERICK E. COLMAN, Nork Park, Epsom, for **Red Knight** 5818, born Feb. 9, 1897, bred by the late J. J. Colman, Carrow House, Norwich; *s.* Ruby Prince 4131, *d.* Silent Anna 8978 *by* Ruby King.

750 II. (£10.)—JAMES E. PLATT, Bruntwood, Cheadle, for **Champion** 5370, born Jan. 1, 1897, bred by Garrett Taylor, Trowse House, Norwich; *s.* Red Prince 2902, *d.* Coronet 2nd 5367 *by* Iago 1025.

752 III. (£5.)—ALFRED J. SMITH, Rendlesham, Woodbridge, Suffolk, for **Dandy Dick**, born June 10, 1897; *s.* Dandy 1768, *d.* Grand Belle 6402 *by* Grand Duke 1388.

749 R. N. & H. C.—J. B. DIMMOCK, Shotford Hall, Harleston, Norfolk, for **Shotford Dandy**.

746 Com.—THOMAS BROWN & SON, for **Inca**.

[1] Champion Prize, of £10 given by the Red Polled Society for the best Red Polled Bull exhibited in Classes 99 and 100.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 101.—*Red Polled Cows or Heifers (in-milk or in-calf), calved before or in* 1896. [7 entries, 1 absent.]

757 I. (£15, & **Champion.**[1])—JAMES E. PLATT, Bruntwood, Cheadle, for **Delphine** 9260, born Feb 7, 1894, in-milk, calved March 1, 1899, bred by the late J. J. Colman, Carrow House, Norwich; *s.* Jupiter 2380, *d.* Dorena 6308 *by* Iago 1025.

756 II. (£10, & R. N. for **Champion.**[1])—JAMES E. PLATT, for **Brinhilda** 8377, born Feb. 12, 1893, in-milk, calved April 27, 1899, bred by the late J. J. Colman; *s.* Jupiter 2380, *d.* Brindy 3896 *by* Falstaff 303.

753 III. (£5.)—LORD AMHERST OF HACKNEY, Didlington Hall, Brandon, Norfolk, for **Charmante** 10080, born June 9, 1895, in-milk, calved Dec. 26, 1898; *s.* Caister Spark 3413, *d.* Charm 2nd 7739 *by* Didlington Davyson 2nd 657.

758 **R. N. & H. C.**—JAMES E. PLATT, for **Dorylas.**

759 **H. C.**—S. LEE SMITH, for **Music.**

754 **Com.**—LORDS A. & L. CECIL, for **Flower of Spain.**

Class 102.—*Red Polled Heifers, calved in* 1897. [8 entries, 1 absent.]

761 I. (£10.)—LORD AMHERST OF HACKNEY, Didlington Hall, Brandon, Norfolk, for **Jubilee Emblem** 12483, born June 21; *s.* Caister Spark 3413, *d.* Elaine 9297 *by* Red Shirt 2014.

764 II. (£5.)—JAMES E. PLATT, Bruntwood, Cheadle, for **Delia** 12190, born Jan. 19, bred by the late J. J. Colman, Carrow House, Norwich; *s.* Ruby Prince 4131, *d.* Delphine 9260 *by* Jupiter 2380.

765 **R. N. & H. C.**—JAMES E. PLATT, for **Dodo.**

H. C.—H.R.H. THE DUKE OF YORK, K.G., for No. 760, **Davy**; R. HARVEY MASON, for No. 763, **Dot.**

Class 103.—*Red Polled Heifers, calved in* 1898. [5 entries.]

770 I. (£10.)—JAMES E. PLATT, Bruntwood, Cheadle, for **Dormouse**, born April 22, bred by the late J. J. Colman, Carrow House, Norwich; *s.* Redmond 5147, *d.* Dorena 6308 *by* Iago 1025.

771 II. (£5.)—JAMES E. PLATT, Cheadle, for **Red Lass**, born Jan. 23, bred by the late J. J. Colman; *s.* Rosy Boy 4627, *d.* Red Top 8911 *by* Red Prince 2902.

768 **R. N. & H. C.**—LORD AMHERST OF HACKNEY, Didlington Hall, Brandon, for **Didlington Davy 10th.**

H. C.—R. HARVEY MASON, for No. 769 **Bess**; ALFRED J. SMITH, for No. 772 **Rendlesham Record.**

Aberdeen Angus.

Class 104.—*Aberdeen Angus Bulls, calved in* 1894, 1895, *or* 1896. [7 entries, 2 absent.]

773 I. (£15, & **Champion.**[2])—THE REV. CHARLES BOLDEN, Preston Bissett, Buckingham, for **Proud Duke of Ballindalloch** 12031, born May 8, 1894, bred by Sir G. M. Grant, Bart., Ballindalloch Castle, N.B.; *s.* Prince Inca 7844, *d.* Pride of Dalmore 4th 13914 *by* The Black Knight 1809.

[1] Champion Prize of £10 given by the Red Polled Society for the best Red Polled Cow or Heifer exhibited in Classes 101–103.

[2] Gold Medal, given by the Polled Cattle Society for the best Aberdeen Angus animal exhibited in Classes 104–108.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

776 **II.** (£10, & **R. N.** for **Champion.**[1])—ALEXANDER MCLAREN, Auchnaguie, Tullymet, Ballinluig, N.B., for **Delamere** 13305, born Jan. 15, 1896, bred by P. Chalmers, Aldbar Castle, Brechin; *s.* Enthusiast of Ballindalloch 8289, *d.* Pride of Burnshangie 21047 *by* Pilchard 7827.

778 **III.** (£5.)—J. H. TRITTON, Lyons Hall, Great Leighs, Chelmsford, for **Esteban** 13394, born Feb. 18, 1896, bred by Sir G. M. Grant, Bart., Ballindalloch Castle, N.B.; *s.* Prince Inca 7844, *d.* Edelweiss 5605 *by* Young Viscount 736.

779 **R. N. & H. C.**—COL. W. N. TUFNELL, Langleys, Gt. Waltham, for **Doodle.**

777 **Com.**—GEORGE OSENTON, for **Jerningham.**

Class 105.—*Aberdeen Angus Bulls, calved in* 1897 *or* 1898. [7 entries, none absent.]

780 **I.** (£15.)—FRED CRISP, White House, New Southgate, Middlesex, for **Governor of Abergeldie** 14447, born Jan. 8, 1897, bred by Her Majesty the Queen, Abergeldie Mains, N.B.; *s.* Eulenberg 10825, *d.* Gentian of Ballindalloch 19258 *by* Prince Inca 7844.

785 **II.** (£10.)—COLONEL W. N. TUFNELL, Langleys, Great Waltham, Chelmsford, for **Offi** 15812, born March 7, 1897; *s.* Lord Monken 9341, *d.* Olivette 19922 *by* Klarikoff 5477.

782 **III.** (£5.)—W. B. GREENFIELD, Haynes Park, Bedford, for **Just Rover of Morlich** 15605, born Feb. 24, 1898, bred by G. Cran, Morlich, Glenkindie, N.B.; *s.* Rover of Craibstone 12948, *d.* Jemima 27th of Morlich 22764 *by* Lord Chamberlain 4823.

786 **R. N. & H. C.**—C. W. SOFER WHITBURN, Addington Park, West Malling, for **Kilgraston.**

784 **H. C.**—SIR J. BLUNDELL MAPLE, BT., M.P., for **Lamplighter of Southgate.**

781 **Com.**—JAMES DIXON, for **April 1.**

Class 106.—*Aberdeen Angus Cows or Heifers (in-milk or in-calf), calved before or in* 1896. [10 entries, 3 absent.]

790 **I.** (£15.)—W. B. GREENFIELD, Haynes Park, Bedford, for **Elena of Naughton 2nd** 21647, born Dec. 20, 1893, in-milk, calved Dec. 13, 1898, and in-calf, bred by Miss Morison Duncan, Naughton, Dundee; *s.* Jot 10109, *d.* Elena of Naughton 17774 *by* Emperor Frederick 6694.

794 **II.** (£10.)—COLONEL W. N. TUFNELL, Langleys, Great Waltham, Chelmsford, for **Valery** 17792, born Feb. 23, 1891, in-milk, calved Jan. 16, 1899, bred by A. Egginton, South Ella, Hull; *s.* Ensign of Guisachan 6011, *d.* Valentine of South Ella 11091 *by* Edile 2709.

789 **III.** (£5.)—FRED CRISP, White House, New Southgate, Middlesex, for **Sabrina of Gorthlick** 20353, born March 20, 1893, in-milk, calved Jan. 29, 1899, bred by J. C. Cunningham, Foyers, Gorthlick, N.B.; *s.* Ajax of Guisachan 2438, *d.* Sulina 8223 *by* Lambro 2911.

787 **R. N. & H. C.**—ALEX. BROWNE, Knowlton Court, Kent, for **Beauty Flower.**

791 **H. C.**—R. W. HUDSON, for **Queen of Haynes 5th.**

Com.—J. H. TRITTON, for No. 793, **Millefleur of Minmore**; C. W. SOFER WHITBURN, for No. 795, **Merle of Kinermony.**

Class 107.—*Aberdeen Angus Heifers, calved in* 1897. [10 entries, 3 absent.]

805 **I.** (£10.)—COLONEL W. N. TUFNELL, Langleys, Great Waltham, Chelmsford, for **Golden Bee of Southgate** 25226, born Jan. 26, bred by Fred Crisp, White House, New Southgate; *s.* Gilderoy 9208, *d.* Golden Bee 2nd 20074 *by* Freedom of Guisachan 6752.

---

[1] Gold Medal, given by the Polled Cattle Society for the best Aberdeen Angus animal exhibited in Classes 104–108.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

803 II. (£5.)—SIR J. BLUNDELL MAPLE, BT., M.P., Childwickbury, St. Albans, for **Pride of Southgate** 25228, born Jan. 15, bred by Fred Crisp, White House, New Southgate; *s.* Gilderoy 9208, *d.* Pride of Pitcraigie 19010 *by* Bloodstone 8133.

804 R. N. & H. C.—GEORGE OSENTON, Mariners, Westerham, for **Carmen of Mariners.**

H. C.—W. B. GREENFIELD, for No. 800, **Charlotte of Haynes 2nd**; R. W. HUDSON, for No. 801, **Danesfield Lass.**

Com.—JAMES DIXON, for No. 799, **Hopper**; C. W. SOFER WHITBURN, for No. 806, **Vine 2nd of Woodhead.**

Class 108.—*Aberdeen Angus Heifers, calved in* 1898. [12 entries, 1 absent.]

815 I. (£10.)—SIR J. BLUNDELL MAPLE, BT., M.P., Childwickbury, St. Albans, for **Benefit 10th of Haynes** 26987, born Jan. 24, bred by W. B. Greenfield, Haynes Park, Bedford; *s.* Black Prince of Ardingly 11464, *d.* Benefit 6th of Haynes 21875 *by* Monarch 2nd of Advie 11094.

812 II. (£5.)—R. W. HUDSON, Danesfield, Great Marlow, for **Tippet of Danesfield** 27034, born Jan. 3; *s.* Albion 6525, *d.* Tip 2nd of Wynyard 24787 *by* Ebro 8263.

811 R. N. & H. C.—R. W. HUDSON, Great Marlow, for **Cumbria 5th.**

H. C.—A. BROWNE, for No. 808, **Knowlton Bell**; W. W. HUBBLE, for No. 810, **Gadie.**

Com.—JAMES DIXON, for No. 809, **Jeanie 3rd of Luddick**; C. W. SOFER WHITBURN, for No. 818, **Meadow Beauty of Advie.**

Galloways.

Class 109.—*Galloway Bulls, calved in* 1894, 1895, *or* 1896. [2 entries.]

819 I. (£15.)—JOHN CUNNINGHAM, Durham Hill, Dalbeattie, for **Scottish Standard** 6488, born April 5, 1895, bred by C. Graham, Harelaw Hill, Canonbie; *s.* The Pathfinder 3rd 5991, *d.* Gentle Rose 2nd 13029 *by* Camp Follower 5042.

820 II. (£10.)—HENRY GRAHAM, Quarry Hill, Mealsgate, Cumberland, for **Blackamore** 6622, born April 20, 1896, bred by W. Parkin-Moore, Whitehall, Mealsgate, ; *s.* Nonpareil of Castlemilk 6163, *d.* Nancy Lee 2nd 11992 *by* Scottish Borderer 669.

Class 110.—*Galloway Bulls, calved in* 1897 *or* 1898. [4 entries.]

821 I. (£15.)—JOHN CUNNINGHAM, Durham Hill, Dalbeattie, for **Black Prince of Durham Hill** 6846, born Feb. 18, 1897; *s.* Campfollower 5042, *d.* Dora 4th of Tarbreoch 11996 *by* Harden 1151.

823 II. (£10.)—ROBERT JEFFERSON, Rothersyke, Egremont, Cumberland, for **Jubilee Gift** 6856, born Jan. 2, 1897, bred by C. Graham, Harelaw Hill, Canonbie, N.B.; *s.* The Pathfinder 3rd 5991, *d.* Harelaw Hill Lizzie 13031 *by* Camp Follower 5042.

824 R. N. & H. C.—L. PILKINGTON, Cavens, Dumfries, for **Banner of Naworth.**

822 Com.—HENRY GRAHAM, for **Kingmoor.**

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 111.—*Galloway Cows or Heifers (in-milk or in-calf), calved before or in* 1896. [3 entries.]

825 **I.** (£15.)—JOHN CUNNINGHAM, Durham Hill, Dalbeattie, for **Dora of Durham Hill** 13550, born March 4, 1893, in-milk, calved Feb. 4, 1899, bred by James Cunningham, Tarbreoch, Dalbeattie; *s.* Camp Follower 5042, *d.* Dora 4th of Tarbreoch 11996 *by* Harden 1151.

826 **II.** (£10.)—JOHN CUNNINGHAM, Dalbeattie, for **Louisa 2nd of Durham Hill** 14925, born April 4, 1896, calved Jan. 2, 1899; *s.* Camp Follower 5042, *d.* Dora 4th of Tarbreoch 11996 *by* Harden 1151.

827 **R. N. & H. C.**—ROBERT JEFFERSON, Rothersyke, Egremont, Cumberland, for **Gaiety of Whitehall.**

Class 112.—*Galloway Heifers, calved in* 1897. [3 entries.]

828 **I.** (£10.)—JOHN CUNNINGHAM, Durham Hill, Dalbeattie, for **Maggie Lauder 2nd of Durham Hill** 15140, born Jan. 3; *s.* Camp Follower 5042, *d.* Maggie Lauder of Durham Hill 13994 *by* Pathfinder 2nd 5838.

830 **II.** (£5.)—H. C. STEPHENS, M.P., Cholderton Lodge, Salisbury, for **Caprice 3rd of Quarley** 15062, born Jan. 29; *s.* Rascal 6118, *d.* Caprice of Cholderton 14231 *by* Vanquisher of Drumlanrig 4963.

829 **R. N. & H. C.**—H. C. STEPHENS, M.P., for **Baroness 3rd of Quarley.**

Class 113.—*Galloway Heifers, calved in* 1898. [3 entries, 1 absent.]

833 **I.** (£10.)—ROBERT JEFFERSON, Rothersyke, Egremont, Cumberland, for **In Clover,** 15438, born Feb. 23; *s.* Lord Tennyson 6418, *d.* Jane Stanley 2nd 13929 *by* Sir Graham 6th 5849.

831 **II.** (£5.)—JOHN CUNNINGHAM, Durham Hill, Dalbeattie, for **Miss Emily 3rd of Durham Hill** 15469, born March 8; *s.* Camp Follower 5042, *d.* Lady Emily 2nd 13549 *by* Young Scottie 5074.

Ayrshires.

Class 114.—*Ayrshire Bulls, calved in* 1894, 1895, *or* 1896. [No entry.]

Class 115.—*Ayrshire Bulls, calved in* 1897 *or* 1898. [3 entries.]

836 **I.** (£15.)—ANDREW MITCHELL, Barcheskie, Kirkcudbright, for **The Baron,** white and brown, born March 5, 1898; *s.* Mischief Maker 3892, *d.* White Rose 3rd *by* Charlie of Torcross 1695.

834 **II.** (£10.)—ANDREW MITCHELL, Kirkcudbright, for **Baron 2nd,** white and brown, born May 4, 1898; *s.* Mischief Maker 3892, *d.* Forget-me-not *by* Cock-a-bendie 1204.

835 **R. N. & H. C.**—ANDREW MITCHELL, Kirkcudbright, for **Kenmuir.**

Class 116.—*Ayrshire Cows or Heifers (in-milk or in-calf), calved before or in* 1896. [6 entries, 1 absent.]

837 **I.** (£15.)—ALEXANDER CROSS, Knockdon, Maybole, N.B., for **Apple 5th of Knockdon** 10527, mostly white, born May 3, 1896, in-milk, calved May 19, 1899; *s.* Prince of Avondale of Auchincloch (vol. xvi.), *d.* Apple 2nd of Knockdon 6389 *by* Bobbie of Knockdon 1381.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

842 II. (£10.)—LEONARD PILKINGTON, Cavens, Dumfries, for **Yellow Bess 4th of Castlehill** 8813, white, born April 6, 1892, in-milk, [calved June 24, 1899], bred by A. Kerr, Castlehill, Thornhill; *s.* Peter of Whitehill 1397, *d.* Yellow Bess 3rd of Drumlanrig 1150 *by* Knight of Drumlanrig 35.

838 III. (£5.)—ALEXANDER CROSS, Maybole, for **Derby Polly 3rd of Knockdon** 9188, mostly white, born March 20, 1894, in-milk, calved May 18, 1899; *s.* Prince Charlie of Newton 1931, *d.* Polly 2nd of Knockdon 6079 *by* Baron 2nd of Drumlanrig 337.

840 R. N. & H. C.—ANDREW MITCHELL, Kirkcudbright, for **Myrtle.**

839 Com.—ANDREW MITCHELL, for **Laura.**

Class 117.—*Ayrshire Heifers, calved in* 1897. [2 entries.]

844 I. (£10.)—ANDREW MITCHELL, Barcheskie, Kirkcudbright, for **White Rose 3rd of Monkland** 11665, white and brown, born April 3, bred by T. Barr, Monkland, Kilmarnock; *s.* White Cockade of Nether Craig 2852, *d.* White Rose of Monkland 9587 *by* Snowball of Alticane 2323.

843 II. (£5.)—ANDREW MITCHELL, Kirkcudbright, for **Buttercup 2nd,** white and brown, born May 4; *s.* Field Marshal of Cavens 3015, *d.* Buttercup of Hartwood 7861 *by* Clansman of Hartwood 2024.

Class 118.—*Ayrshire Heifers, calved in* 1898. [2 entries, 1 absent.]

845 I. (£10.)—ANDREW MITCHELL, Barcheskie, Kirkcudbright, for **Fernie,** brown and white, born May 9; *s.* Mischief Maker 3892, *d.* May Mischief *by* Style for Ever.

Jerseys.

N.B.—In the Jersey Classes the number inserted within brackets after the name of an animal indicates the number of such animal in the Island Herd Book. A number without brackets indicates that the animal is registered in the English Jersey Herd Book.

Class 119.—*Jersey Bulls, calved in* 1895, 1896, *or* 1897. [19 entries, 6 absent.]

849 I. (£15.)—SIR JAMES BLYTH, BT., Blythwood, Stansted, Essex, for **Crown Prince,** brown, born Sept. 25, 1896, bred by J. S. Arthur, St. Mary's, Jersey; *s.* Golden Pasha (2154), *d.* Silver Crown 4th (5234).

854 II. (£10.)—CHARLES COMBE, Cobham Park, Cobham, Surrey, for **Jubilee** (vol. ix. p. 29), dark fawn, born May 11, 1897; *s.* Augerez Ruby 5787, *d.* Java 3rd *by* Angela's Lad 1307.

850 III. (£5.)—W. MCKENZIE BRADLEY, Leylands, Meopham, Kent, for **Leylands Champion** (vol. viii. p. 19), whole colour, born May 5, 1896; *s.* Groufille's Lad 5197; *d.* Lady Lavinia 5th *by* Everton King 7th 3254.

853 R. N. & H. C.—EARL CADOGAN, K.G., Culford Hall, Bury St. Edmunds, for **Blucher.**

H. C.—ADMIRAL THE HON. T. S. BRAND, for No. 851, **Stars Hero**; F. FREEMAN-THOMAS, for No. 855, **Buttertooth.**

Com.—ANTONY GIBBS, for No. 858, **Skipper**; H. L. B. MCCALMONT, M.P., for No. 861, **Chancellor.**

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 120.—*Jersey Bulls, calved in* 1898. [25 entries, 11 absent.]

887 **I.** (£10.)—MRS. CYRIL E. GREENALL, Walton Hall, Warrington, for **Golden Rioto**, fawn, born April 12; *s.* Golden Baron 5173, *d.* Rioto (vol. viii. p. 238) *by* Nunthorpe 4648.

895 **II.** (£5.)—MRS. CHARLOTTE McINTOSH, Havering Park, Essex, for **Havering Pride**, dark fawn, born May 4; *s.* Montpelier 5294, *d.* Ivy Green *by* Viscount (1353).

883 **R. N. & H. C.**—CAPT. A. B. S. FRASER, West Tarring Farm, Worthing, for **Jersey Yet** (late Duke of Rosedale).

H. C.—W. M. CAZALET, for No. 879, **Easter Gift**; J. R. CORBETT, for No. 881, **Benjamin**; LORD HILLINGDON, for No. 889, **Mornington**, and for No. 890, *s.* Rosy Morn *d.* Hawfinch; THE DUCHESS OF WELLINGTON, for No. 899, **Veracity**.

Com.—C. W. ARMITAGE, for No. 867, **Marquis**; SIR JAS. BLYTH, BT., for No. 871, **Oompah's Tenda**; A. E. BURNABY, for No. 876, **Sirdar**; CHAS. COMBE, for No. 880, **Koko**; LORD ROTHSCHILD, for No. 898, **Geonnais Lad.**

Class 121.—*Jersey Cows (in-milk), calved before or in* 1896. [21 entries, 8 absent.]

919 **I.** (£15.)—LORD ROTHSCHILD, Tring Park, Herts, for **Cherry** (vol. viii. p. 193), brown, born June 24, 1894, in-milk, calved Feb. 15, 1899, bred by J. C. Le Sueur, Grouville, Jersey; *s.* Nunthorpe 4648, *d.* Cherry Belle (7791).

903 **II.** (£10.)—W. McKENZIE BRADLEY, Leylands, Meopham, Kent, for **Beresford Pride** (vol. viii. p. 185), whole colour, born Aug. 20, 1893, in-milk, calved March 31, 1899, bred by M. Le Gallais, Grouville, Jersey; *s.* Orme 4296, *d.* Turtle Dove (4354) *by* John Brown 5608.

904 **III.** (£5.)—W. McKENZIE BRADLEY, Meopham, for **Melvina 3rd** (vol. viii. p. 226), whole colour, born Feb. 4, 1894, in-milk, calved May 8, 1899, bred by J. P. Falle, St. Mary's, Jersey; *s.* Lowland King 4616, *d.* Melvina (2806) F.S.C.

917 **R. N. & H. C.**—R. J. POPE, Plumpton, Lewes, for **Souvenir 2nd.**

H. C.—MRS. C. E. GREENALL, for No. 911, **Péronne**; H. L. B. McCALMONT, M.P., for No. 912, **Lottie**; LORD ROTHSCHILD, for No. 920, **Dairy's Golden**; THE DUCHESS OF WELLINGTON, for No. 921, **Myrtle Beresford.**

Com.—C. W. ARMITAGE, for No. 902, **Pilot's Legacy 5th**; ANTONY GIBBS, for No. 907, **Buttercup 3rd**, and for No. 908, **Lass of Jersey 2nd**; H. L. B. McCALMONT, M.P., for No. 914, **Orange Lily.**

Class 122.—*Jersey Heifers (in-milk or in-calf), calved in* 1897. [30 entries, 12 absent.]

943 **I.** (£15.)—MRS. CHARLOTTE McINTOSH, Havering Park, Essex, for **Havering Carnatie** (vol. ix. p. 63), fawn, born April 21, in-milk, calved May 10, 1899; *s.* Montpellier 5294, *d.* Carnatie 2nd *by* Rosebay's Lad 1730.

949 **II.** (£10.)—LORD ROTHSCHILD, Tring Park, Herts., for **Lotus Lily** (8569), fawn, born in 1897, in-milk, calved March 8, 1899, bred by J. H. Orange, St. Brelade's, Jersey.

947 **III.** (£5.)—R. J. POPE, Beresford Manor, Plumpton, Lewes, for **Reinette**, dark brown, born Feb. 23, in-milk, calved May 6, 1899, bred by J. G. Renouf, St. Martin's, Jersey; *s.* Golden Ferns Lad (2160), *d.* May Queen 3rd (2534)

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

948 **R. N. & H. C.**—LORD ROTHSCHILD, Tring Park, for **Jewel.**
H. C.—EARL CADOGAN, K.G., for No. 927, **Golden Sheaf**; FOWLER AND DE LA PERRELLE, for No. 935, **Philomene 2nd**; H. L. B. MCCALMONT, M.P., for No. 942, **Lady Scot.**
Com.—WM. AMY, for No. 923, **Highfield Rose**; C. W. ARMITAGE, for No. 925, **Pilot's Legacy 10th**; P. H. FOWLER, for No. 931, **Marseillaise**, and for No. 932, **Oakland's Darkie**; FOWLER & DE LA PERRELLE, for No. 933, **Eclipse**; H. L. B. MCCALMONT, M.P., for No. 941, **Harmony**; LORD ROTHSCHILD, for No. 950, **Queen Mab.**

Class 123.—*Jersey Heifers, calved in* 1898. [38 entries, 8 absent.]

987 **I.** (£15.)—THE DUCHESS OF WELLINGTON, Strathfieldsaye House, Mortimer, R.S.O., Berks., for **Curraghmore**, whole colour, born May 22; *s.* Lord William Beresford, *d.* Minnie Beresford *by* Golden Lad 3324.

958 **II.** (£10.)—EARL CADOGAN, K.G., Culford Hall, Bury St. Edmunds, for **Beatrice**, fawn, born July 1; *s.* Bessemer (vol. viii. p. 26), *d.* Golden Streak *by* Golden Fluke 4557.

966 **III.** (£5.)—F. FREEMAN-THOMAS, Ratton, Willingdon, Sussex, for **Romneya**, fawn, born April 12; *s.* Buttertooth 5491, *d.* Rosemary (vol. vii. p. 307) *by* Wooloomooloo 5447.

960 **R. N. & H. C.**—JOSEPH CARSON, Crystal Brook Farm, Theydon Bois, Essex, for **Nun Nicer.**
H. C.—MRS. WALTER BARRON, for No. 953, **Phyllis 6th**; W. MCKENZIE BRADLEY, for No. 956, **Flora's Sylvia**; EARL CADOGAN, K.G., for No. 959, **Norah**; J. R. CORBETT, for No. 961, **Em D.**; ANTONY GIBBS, for No. 970, **Lass of Jersey 3rd**; L. G. GISBORNE, for No. 972, **Maisonette Dora**; MRS. C. E. GREENALL, for No. 973, **Sweet Eyes 2nd**; H. L. B. MCCALMONT, M.P., for No. 979, **Florence**; LORD ROTHSCHILD, for No. 985, **Gaiety.**
Com.—MRS. WALTER BARRON, for No. 952, **Lady Tidy 6th**; SIR JAMES BLYTH, BT., for No. 954, **Lady Clementina**, and for No. 955, **Rose of Sharon**; W. MCKENZIE BRADLEY, for No. 957, **Pretty Owl**; J. R. CORBETT, for No. 962, **Starbright 4th**; F. FREEMAN-THOMAS, for No. 964, **Laburnam**; LORD HILLINGDON, for No. 975, **Hostage**; E. MURRAY IND, for No. 977, **Maitland Countess 4th**; MRS. MCINTOSH, for No. 980, **Havering Codrette**; THE DUCHESS OF WELLINGTON, for No. 989, **Laburnum.**

Guernseys.

N.B.—Unless otherwise stated, the numbers refer to the English Guernsey Herd Book.

Class 124.—*Guernsey Bulls, calved in* 1895, 1896, *or* 1897. [11 entries, 3 absent.]

991 **I.** (£15.)—W. A. GLYNN, Seagrove, Seaview, Isle of Wight, for **Frolic 6th** 899, orange, fawn and white, born Feb. 28, 1896; *s.* Frolic 5th 612, *d.* Favourite 9th 760 *by* Hopeful 25.

993 **II.** (£10.)—E. A. HAMBRO, Hayes Place, Kent, for **Jubilee Conqueror** 1008, fawn and white, born May 26, 1896, bred by A. J. Ozanne, Patron, St. Peter's Port, Guernsey; *s.* Masher 2nd 858 P.S., R.G.A.S., *d.* Sunlight 3rd 1946 P.S., R.G.A.S.

997 **III.** (£5.)—MRS. MONTEFIORE, Worth Park, Crawley, for **Signalman 2nd** 1048, fawn and white, born Feb. 22, 1897, bred by Sir F. A. Montefiore, Bt., Worth Park, Crawley; *s.* Signalman 585, *d.* Miranda 6th 2253 *by* Yeoman 454.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

995 **R. N. & H. C.**—J. P. MARTEL, La Lande, Castel, Guernsey, for **Rydale 7th.**
999 **H. C.**—J. D. TOOGOOD PARSONS, JUN., for **Lord Kitchener.**
994 **Com.**—THE EARL OF HAREWOOD, for **Renommé.**

Class 125.—*Guernsey Bulls, calved in* 1898. [10 entries, 1 absent.]

1003 **I.** (£10.)—J. C. FORSTER, Clatford Mills, Andover, for **Captain Lyons 2nd** 1159 P.S., R.G.A.S., red and white, born April 9, bred by A. Brehaut, Pages, St. Martin's, Guernsey; *s.* Squire of the Hollards, 1038 P.S., R.G.A.S., *d.* Fleurie 6th.

1011 **II.** (£5.)—V. J. AUSTEN WILLETT, Apse Manor, Shanklin, Isle of Wight, for **Apse Field Marshal** 1073, orange, fawn and white, born May 6; *s.* Captain of the Wight 970, *d.* Rose des Islets 3160.

1004 **R. N. & H. C.**—H. J. GIBBS, Milford, Salisbury, for **Milford Ensign.**
H. C.—W. A. GLYNN, for No. 1005, **Clio**; GEORGE LONG, for No. 1007, **Sheaf of Gold**; LORD MONTAGU, for No. 1008, **Marquis of Beaulieu.**

Class 126.—*Guernsey Cows or Heifers (in-milk or in-calf), calved before or in* 1896. [14 entries, 6 absent.]

1026 **I.** (£15.)—A. H. WINGFIELD, Ampthill House, Ampthill, Beds., for **Lady Jane of Ampthill** 4138, red and white, born April 18, 1888, in-milk, calved Feb. 12, 1899, bred by J. Froome, St. Martin's, Guernsey; *s.* Rydale 214 G.H.B., *d.* Lady Jane 1st.

1012 **II.** (£10.)—MRS. MONTEFIORE, Worth Park, Crawley, Sussex, for **Claremont Flora**, 4529, fawn and white, born Feb. 2, 1892, in-milk, calved April 12, 1899, bred by A. Hansferd, St. Peter's Port, Guernsey; *s.* Deputy, *d.* Starlight.

1018 **III.** (£5.)—E. A. HAMBRO, Hayes Place, Kent, for **Bella 3rd**, fawn and white, born Nov. 26, 1895, in-milk, calved May 22, 1899, bred by G. Alley, Le Pencher, Castel, Guernsey; *s.* Lord Clyde, *d.* Bella 2nd.

1025 **R. N. & H. C.**—LADY TICHBORNE, for **Esperance.**
H. C.—E. A. HAMBRO, for No. 1019, **Express**; LADY TICHBORNE, for No. 1024, **Beauty du Bigard.**

Class 127.—*Guernsey Heifers, calved in* 1897. [10 entries, 1 absent.]

1027 **I.** (£10.)—JOHN C. FORSTER, Clatford Mills, Andover, for **Antona 7th** 3593, red and white, born May 26; *s.* Young Sarnia 848, *d.* Antona 5th 2851 *by* Jove.

1029 **II.** (£5.)—E. A. HAMBRO, Hayes Place, Kent, for **Hayes Lily of the Preél**, fawn and white, born May 21, bred by J. W. Martel, Preél, Castel, Guernsey; *s.* Loyal of the Hunguets 978 P.S., R.G.A.S., *d.* Lily of the Preél 374 P.S., R.G.A.S.

1033 **R. N. & H. C.**—MRS. MONTEFIORE, Worth Park, for **Rose of Sharon.**

H. C.—E. A. HAMBRO, for No. 1030, **Silverspade**; MRS. MONTEFIORE, for No. 1034, **Silvester 2nd.**

1036 **Com.**—J. D. TOOGOOD PARSONS, JUN., for **Golden Bud 2nd.**

Class 128.—*Guernsey Heifers, calved in* 1898. [20 entries, 5 absent.]

1044 **I.** (£10.)—E. A. HAMBRO, Hayes Place, Kent, for **Hayes Musette 2nd**, fawn and white, born Sept. 21; *s.* Amphion 753, *d.* Hayes Musette.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1054 II. (£5.)—LADY TICHBORNE, Tichborne Park, Alresford, Hants, for **Royal Rose** 4279, fawn, white markings, born June 12; *s.* Active Lad 653, *d.* Tea Rose 2336 *by* Let Me Try 247, F.S., R.G.A.S.

1043 R. N. & H. C.—W. A. GLYNN, Seagrove, Seaview, Isle of Wight, for **Favourite 23rd.**

H. C.—J. C. FORSTER, for No. 1038, **Butter Queen 2nd**, and for No. 1039, **Deanie 8th**; MRS. MONTEFIORE, for No. 1047, **Fair Valentine 7th**; LADY TICHBORNE, for No. 1053, **Daisy Chain**; V. J. A. WILLETT, for No. 1055, **Apse Fancy**; A. H. WINGFIELD, for No. 1056, **Celia 2nd.**

Com.—H. J. GIBBS, for No. 1041, **Milford Lupin**; E. A. HAMBRO, for No. 1045, **Hayes Richesse**; H. M. OZANNE, for No. 1049, **Olive Tree.**

Kerries.

Class 129.—*Kerry Bulls, calved in* 1896, 1897, *or* 1898.
[6 entries, one absent.]

1061 I. (£10, & Champion.[1])—ROBERTSON & SONS, Church Farm, Babraham, Cambridge, for **La Mancha Merry Boy**, born July 3, 1898, bred by R. Barter, Blarney, Co. Cork; *s.* Aicme Prince 349, *d.* Aicme Carlow 2540.

1058 II. (£5.)—W. H. MULLENS, Westfield Place, Battle, Sussex, for **Waterville Sirdar** 434, born May 20, 1897, bred by J. E. Butler, Waterville, Co. Kerry; *s.* Aicme Prince 349, *d.* Waterville Minnie 1764 *by* Waterville Auctioneer 178.

1062 R. N.—ROBERTSON & SONS, for **La Mancha Yet.**

Class 130.—*Kerry Cows or Heifers (in-milk or in-calf), of any age.*
[5 entries, 1 absent.]

1066 I. (£10, & R. N. for Champion.[1])—ROBERTSON & SONS, Church Farm, Babraham, Cambridge, for **Eyvind and Treas** 379, born July 5, 1889, in-milk, calved April 7, 1899, bred by P. Mahony, Kilmorna, Co. Kerry; *s.* O'Ruarc 29, *d.* Eyvind an Dara 85 *by* Aherlow 1.

1065 II. (£5.)—W. H. MULLENS, Westfield Place, Battle, Sussex, for **Waterville Desdemona** 1752, born in March, 1891, in-milk, calved April 30, 1899, bred by J. E. Butler, Waterville, Co. Kerry.

1067 R. N.—ROBERTSON & SONS, for **La Mancha Goletta.**

Dexters.

Class 131.—*Dexter Bulls, calved in* 1896, 1897, *or* 1898.
[8 entries, none absent.]

1074 I. (£10, & R. N. for Champion.[2])—E. SYDNEY WOODIWISS, Upminster Essex, for **Black Knight**, black, born in March, 1897, breeder unknown.

1068 II. (£5.)—H.R.H. THE PRINCE OF WALES, K.G., Sandringham, for **Bantam Cock**, red, born June 5, 1898; *s.* Bantam 257, *d.* Dainty Girl 660.

1070 R. N. & H. C.—COUNTESS DE LA WARR, The Manor House, Bexhill, for **Buckhurst Khalifa.**

---

[1] Prize of Twenty Guineas, given by the Kerry and Dexter Cattle Society for the best Kerry animals exhibited in Classes 129 and 130.
[2] Cup, value Twenty-five Guineas, given by the Kerry and Dexter Cattle Society for the best Dexter animal exhibited in Classes 131 and 132.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 132.—*Dexter Cows or Heifers (in-milk or in-calf), of any age.* [8 entries, none absent.]

1076 **I. (£10, & Champion.[1])**—H.R.H. THE PRINCE OF WALES, K.G., Sandringham, for **Baha**, 2371, black, born in 1892, in-milk, calved May 13, 1899, breeder unknown.

1078 **II.** (£5.)—COUNTESS DE LA WARR, The Manor House, Bexhill, for **Buxted White Heather** 853, red, born in 1895, in-milk, calved May 6, 1899, breeder unknown.

1083 **R. N. & H. C.**—E. SYDNEY WOODIWISS, Upminster, Essex, for **Wee Kate.**

1082 **H. C.**—E. SYDNEY WOODIWISS, for **Sweet Lavender.**

Com.—COUNTESS DE LA WARR, for No. 1077, **Buckhurst Gem**; ROBERTSON & SONS, for No. 1080, **La Mancha Tiny Ann**; T. C. T. WARNER, for No. 1081, **La Mancha Aggie.**

DAIRY CATTLE.

Class 133.—*Dairy Cows (in-milk), of the Shorthorn, Ayrshire, or other pure breed not named in Class* 135, *judged for the yield and quality of their milk combined, the milk to contain (on the average of two milkings)* 12 *per cent. of total solids, of which not less than* 3 *per cent. shall be fat.* [8 entries, 1 absent.]

1086 **I. (£15.)**—JOHN EVENS, Burton, Lincoln, for **White Foot** (vol. iii. p. 37) (Lincolnshire Red Shorthorn), born Dec. 14, 1891, calved May 13, 1899, *s.* Burgh, *d.* Strawberry 2nd *by* Beauty Bull.

1085 **II. (£10.)**—JOHN EVENS, for **Old Profit** (vol. i. p. 45) (Lincolnshire Red Shorthorn), born Dec. 29, 1887, calved May 10, 1899; *s.* Beauty Bull, *d.* No. 20 *by* Hag 134.

1088 **III. (£5.)**—WILLIAM NISBET, Park Gate, Stratford St. Andrew, Saxmundham, for **Rosebud** (Ayrshire), red and white, born in 1891, bred by J. Nisbet, Kelsale, Saxmundham; *s.* Major, *d.* Beauty *by* Tommy.

1084 **R. N.**—JOHN EVENS, for **Bountiful.**

Class 134.—*Dairy Cows (in-milk), of any breed or cross, giving the largest quantity of milk, containing (on the average of two milkings)* 12 *per cent. of total solids, of which not less than* 3 *per cent. shall be fat.* [6 entries, 1 absent.]

1097 **I. (£15.)**—J. F. SPENCER, Hornsey Lane Farm, Highgate, Middlesex, for **Model Maid 2nd** (Shorthorn), roan, born about 1892, in-milk, calved April 1, 1899, breeder unknown.

1095 **II. (£10.)**—J. F. SPENCER, Hornsey Lane Farm, for **Graceful** (Shorthorn), roan, born about 1892, calved May 31, 1899, breeder unknown.

Class 135.—*Dairy Cows (in-milk), of the Jersey, Guernsey, Kerry, or Dexter breeds, judged for their butter-producing qualities.* [10 entries, 2 absent.]

1107 **I. (£15.)**—DR. HERBERT WATNEY, Buckhold, Pangbourne, Berks., for **Siphon** (vol. vi. p. 549) (Jersey), fawn, born Nov. 19, 1891, calved April 29, 1899; *s.* Lord Ronald 4247, *d.* Sherry *by* Thunderbolt 1261.

---

[1] Cup, value Twenty-five Guineas, given by the Kerry and Dexter Cattle Society for the best Dexter animal exhibited in Classes 131 and 132.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1106 **II.** (£10.)—DR. HERBERT WATNEY, Pangbourne, for **Sherbet** (vol. vi. p. 548) (Jersey), fawn, born Nov. 22, 1890, calved April 3, 1899; *s.* The Bard 2212, *d.* Sherry *by* Thunderbolt 1261.

1100 **III.** (£5.)—EARL CADOGAN, K.G., Culford Hall, Bury St. Edmunds, for **Clemency** (vol. vi. p. 314) (Jersey), fawn, born June 14, 1892, calved May 3, 1899; *s.* Royal Boy 4358, *d.* Lady Clementine *by* Mourier King 3556.

1098 **R. N. & Com.**—W. MCKENZIE BRADLEY, Leylands, Meopham, Kent, for **Grand Daughter.**

SHEEP.

By "Two Shear" and "Shearling" are meant sheep born in 1897 *and* 1898 *respectively.*

Leicesters.

Class 136.—*Leicester Two-Shear Rams.* [6 entries, none absent.]

1109 **I.** (£10.)—E. F. JORDAN, Eastburn, Driffield, born March.
1108 **II.** (£5.)—GEORGE HARRISON, Gainford Hall, Darlington, born March.
1113 **R. N. & H. C.**—F. W. D. WATKINSON, for **Helperthorpe Prince.**
1110 **H. C.**—E. F. JORDAN, born March.
1112 **Com.**—J. J. SIMPSON.

Class 137.—*Leicester Shearling Rams.* [9 entries, none absent.]

1114 **I.** (£15), & 1115 **II.** (£10.)—GEORGE HARRISON, Gainford Hall, Darlington, born March.
1116 **III.** (£5.)—E. F. JORDAN, Eastburn, Driffield, born March.
1121 **R. N. & H. C.**—F. W. D. WATKINSON, Weaverthorpe, York, born Mar. 3.
1117 **H. C.**—E. F. JORDAN, born March.
Com.—J. J. SIMPSON, for Nos. 1119 & 1120.

Class 138.—*Pens of Three Leicester Ram Lambs.* [4 entries, none absent.]

1123 **I.** (£10.)—GEORGE HARRISON, Gainford Hall, Darlington, born Feb. or March.
1124 **II.** (£5.)—E. F. JORDAN, Eastburn, Driffield, born March.
1126 **R. N. & H. C.**—F. W. D. WATKINSON, Weaverthorpe, York, born Mar. 2.

Class 139.—*Pens of Three Leicester Shearling Ewes, of the same Flock.* [7 entries, none absent.]

1127 **I.** (£15), & 1128 **III.** (£5.)—GEORGE HARRISON, Gainford Hall, Darlington, born March.
1129 **II.** (£10.)—E. F. JORDAN, Eastburn, Driffield, born March.
1130 **R. N. & H. C.**—E. F. JORDAN, Eastburn, born March.
Com.—J. J. SIMPSON, for No. 1132; F. W. D. WATKINSON, for No. 1133.

Class 140.—*Pens of Three Leicester Ewe Lambs.* [4 entries, none absent.]

1134 **I.** (£10.)—GEORGE HARRISON, Gainford Hall, Darlington, born March.
1135 **II.** (£5.)—E. F. JORDAN, Eastburn, Driffield, born March.
1137 **R. N. & H. C.**—F. W. D. WATKINSON, Weaverthorpe, York.
1136 **Com.**—J. J. SIMPSON.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Cotswolds.

Class 141.—*Cotswold Two-Shear Rams.* [3 entries, 1 absent.]

1139 **I. (£10)**, & 1140 **II. (£5.)**—WM. HOULTON, Broadfield Farm, Northleach, born Feb. and March.

Class 142.—*Cotswold Shearling Rams.* [7 entries, none absent.]

1143 **I. (£15)**, & 1141 **III. (£5.)**—R. & W. T. GARNE, Aldsworth, Northleach, born Jan.

1145 **II. (£10.)** & 1144 **R. N. & Com.**—WM. HOULTON, Broadfield Farm, Northleach, born Feb.

Class 143.—*Pens of Three Cotswold Ram Lambs.* [4 entries, none absent.]

1148 **I. (£10.)**—R. & W. T. GARNE, Aldsworth, Northleach, Glos., born Jan.

1151 **II. (£5.)**—WM. THOMAS, The Hayes, Sully, Barry, Glam., born Jan.

1149 **R. N. & H. C.**—RUSSELL SWANWICK, R. A. C. Farm, Cirencester, born Jan.

Class 144.—*Pens of Three Cotswold Shearling Ewes of the same Flock.* [4 entries, none absent.]

1153 **I. (£15)**, & 1152 **II. (£10.)**—R. & W. T. GARNE, Aldsworth, Northleach, born Jan.

1154 **III. (£5.)**—WM. HOULTON, Broadfield Farm, Northleach, born Feb.

Class 145.—*Pens of Three Cotswold Ewe Lambs.* [3 entries.]

1158 **I. (£10.)**—WM. THOMAS, The Hayes, Sully, Barry, Glam., born Jan.

1156 **II. (£5.)**—R. & W. T. GARNE, Aldsworth, Northleach, born Jan.

1157 **R. N. & Com.**—RUSSELL SWANWICK, R. A. C. Farm, Cirencester, born Jan.

Lincolns.

Class 146.—*Lincoln Two-Shear Rams.* [9 entries, 3 absent.]

1162 **I. (£10, & Champion.[1])**—S. E. DEAN & SONS, Dowsby Hall, Bourne, Lincs., for **Laughton 235 Guineas 4613**, born Feb. 7, bred by J. E. Casswell, Laughton, Folkingham; *s.* Lincoln 130 Guineas 2783.

1167 **II. (£5.)**—R. & W. WRIGHT, Nocton Heath, Lincoln, for **Nocton Melton**, born Feb.; *s.* Last of the Meltons 2752.

1164 **R. N. & H. C.**—HENRY DUDDING, Riby Grove, Great Grimsby, Lincs., born Feb.

1161 **H. C.**—S. E. DEAN & SONS, for **Dowsby Riby II.**

1159 **Com.**—J. E. CASSWELL, for **Dowsby Guardsman.**

Class 147.—*Lincoln Shearling Rams.* [22 entries, 1 absent.]

1172 **I. (£15, & R. N. for Champion.[1])**—TOM CASSWELL, Pointon House, Folkingham, born Feb.

1173 **II. (£10.)**—TOM CASSWELL, Folkingham, born Feb.

---

[1] Prize, of £10 10*s.*, given by the Lincoln Long-Wool Sheep Breeders' Association for the best Lincoln Ram in Classes 146 and 147.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1189 III. (£5.)—R. & W. WRIGHT, Nocton Heath, Lincoln, born Feb.
1177 R. N. & H. C.—HENRY DUDDING, Riby Grove, Great Grimsby.
H. C.—S. E. DEAN & SONS, for No. 1174; HENRY DUDDING, for No. 1178; R. & W. WRIGHT, for No. 1188.
Com.—J. E. CASSWELL, for Nos. 1170 & 1171; HENRY DUDDING, for No. 1179; JOHN PEARS, for No. 1183; HENRY SMITH, JUN., for Nos. 1185 & 1186; R. & W. WRIGHT, for No. 1187.

Class 148.—*Pens of Five Lincoln Shearling Rams.*[1]
[8 entries, 3 absent.]

1192 I. (£15.)—TOM CASSWELL, Pointon House, Folkingham, born Feb.
1195 II. (£10.)—HENRY DUDDING, Riby Grove, Great Grimsby, born Feb.
1197 III. (£5.)—R. & W. WRIGHT, Nocton Heath, Lincoln, born Feb.
1191 R. N. & H. C.—J. E. CASSWELL, Laughton, Folkingham, born Feb.
1190 Com.—JOHN ANDERSON.

Class 149.—*Pens of Three Lincoln Ram Lambs.*
[8 entries, none absent.]

1202 I. (£10.)—HENRY DUDDING, Riby Grove, Gt. Grimsby, born Feb. 10.
1205 II. (£5.)—R. & W. WRIGHT, Nocton Heath, Lincoln, born Feb.
1199 R. N. & H. C.—S. E. DEAN & SONS, Bourne, Lincs., born Feb. 7.
1201 H.C.—HENRY DUDDING.
Com.—S. E. DEAN & SONS, for No. 1198; JOHN PEARS, for No. 1204.

Class 150.—*Pens of Three Lincoln Shearling Ewes, of the same Flock.*
[7 entries, 2 absent.]

1208 I. (£15), & 1209 II. (£10.)—HENRY DUDDING, Riby Grove, Great Grimsby, born Feb. 8.
1210 R. N. & H. C.—JOHN PEARS, Mere, Lincoln, born Feb.
1206 H. C.—S. E. DEAN & SONS, Bourne, Lincs.

Class 151.—*Pens of Three Lincoln Ewe Lambs.*
[7 entries, 1 absent.]

1219 I. (£10.)—R. & W. WRIGHT, Nocton Heath, Lincoln, born Feb.
1216 II. (£5.)—HENRY DUDDING, Riby Grove, Gt. Grimsby, born Feb.
1214 R. N. & H. C.—S. E. DEAN & SONS, Bourne, Lincs., born Feb. 7.
1218 H. C.—JOHN PEARS, Mere, Lincoln.
1213 Com.—S. E. DEAN & SONS, Bourne, Lincs.

Oxford Downs.

Class 152.—*Oxford Down Two-Shear Rams.*
[2 entries.]

1220 I. (£10.)—J. T. HOBBS, Maisey Hampton, Fairford, Glos., born Mar. 17 *s.* Jumbo 2101, *d. by* Bountiful 208.

1221 II. (£5.)—J. & S. TREADWELL, Upper Winchendon, Aylesbury, for Capulet, born Feb.; *s.* Captain 2038, *d. by* Attorney 1379.

Class 153.—*Oxford Down Shearling Rams.* [19 entries, 2 absent.]

1227 I. (£15.)—JAMES T. HOBBS, Maisey Hampton, Fairford, born Feb.

---

[1] Prizes given by the Maidstone Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1224 **II.** (£10.)—Albert Brassey, M.P., Heythrop Park, Chipping Norton, born Jan. 5; *s.* Cote Victor 1434.
1239 **III.** (£5.)—W. A. Treweeke, Ryne Hill, Chipping Norton, born Feb. 21; *s.* Rynall Prince 2654, *d.* by Hobbs No. 4, 1892.
1222 **R. N. & H. C.**—Albert Brassey, M.P., Heythrop Park, born Jan. 18; *s.* Sir James 2660.
H. C.—John C. Eady, for No. 1225; W. A. Treweeke, for No. 1240.
Com.—Hugh W. Stilgoe, for No. 1232; J. and S. Treadwell, for Nos. 1236 and 1238.

Class 154.—*Pens of Three Oxford Down Ram Lambs.* [4 entries, none absent.]

1242 **I.** (£10.)—W. J. P. Reading, Rectory Farm, Lechlade, Glos., born Feb; *ss.* The Dean and Adams No. 1 of 1898.
1241 **II.** (£5.)—Albert Brassey, M.P., Heythrop Park, Chipping Norton, born Jan. 3.
1243 **R. N. & Com.**—George Street, Maulden, Ampthill, Beds., born Feb.

Class 155.—*Pens of Three Oxford Down Shearling Ewes, of the same Flock.* [3 entries.]

1245 **I.** (£15), & 1246 **II.** (£10.)—John C. Eady, Irchester Grange, Welling-boro', born Feb. 6.
1247 **R. N. & Com.**—W. A. Treweeke, Ryne Hill, Chipping Norton, born Feb.

Class 156.—*Pens of Three Oxford Down Ewe Lambs.* [3 entries.]

1249 **I.** (£10.)—Hugh W. Stilgoe, The Grounds, Adderbury, Banbury, born Feb.; *ss.* Boney 2736 and True Briton 2740.
1248 **II.** (£5.)—Albert Brassey, M.P., Heythrop Park, Chipping Norton, born Jan. 4.
1250 **R. N. & Com.**—W. A. Treweeke, Ryne Hill, Chipping Norton, born Jan. 24, 26, and 28.

Shropshires.

Class 157.—*Shropshire Two-Shear Rams.* [9 entries, 4 absent.]

1253 **I.** (£10.)—David Buttar, Corston, Coupar Angus, N.B., born Mar.
1251 **II.** (£5.)—Mrs. Maria Barrs, Odstone Hall, Atherstone, born Mar.
1257 **R. N. & H. C.**—W. F. Inge, Thorpe, Tamworth, for **Thorpe Enterprise.**
1255 **H. C.**—Richard P. Cooper, for **Pentor.**
1259 **Com.**—Alfred Tanner, born Mar.

Class 158.—*Shropshire Shearling Rams.* [50 entries, 8 absent.]

1292 **I.** (£15.)—Andrew E. Mansell, Harrington Hall, Shifnal, born Feb.
1261 **II.** (£10.)—Mrs. Maria Barrs, Odstone Hall, Atherstone, born Mar.
1266 **III.** (£5), & 1267 **R. N. & H. C.**—Arthur Bradburne, Moat Bank, Lichfield, Staffs, born Feb. 20; *s.* Lucky Dream 9564.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

H. C.—MRS. MARIA BARRS, for No. 1262; DAVID BUTTAR, for Nos. 1269 & 1270; P. A. & G. T. EVANS, for No. 1275; THOMAS FENN, for No. 1278; JOHN HARDING, for No. 1283; ANDREW E. MANSELL, for Nos. 1293 & 1294; THOMAS S. MINTON, for No. 1298; JAMES LENOX NAPER, for No. 1300.

Com.—RICHARD P. COOPER, for No. 1272; W. F. INGE, for No. 1289; ALFRED TANNER, for No. 1306; BERNARD WALL, for No. 1307.

Class 159.—*Pens of Three Shropshire Lamb Rams.* [16 entries, 2 absent.]

1310 **I. (£10.)**—MRS. MARIA BARRS, Odstone Hall, Atherstone, born Feb.
1320 **II. (£5.)**—A. E. MANSELL, Harrington Hall, Shifnal, born Feb.
1322 **R. N. & H. C.**—THOMAS S. MINTON, Montford, Shrewsbury, born Feb.
H. C.—P. A. & G. T. EVANS, for No. 1314; JOHN HARDING, for No. 1316; PHILO L. MILLS, for No. 1321.
1317 **Com.**—G. L. FOSTER HARTER.

Class 160.—*Pens of Three Shropshire Shearling Ewes, of the same Flock.* [15 entries, 3 absent.]

1338 **I. (£15.)**—PHILO L. MILLS, Ruddington Hall, Notts., born Mar.
1326 **II. (£10.)**—MRS. MARIA BARRS, Odstone Hall, Atherstone, born Mar.
1328 **III. (£5.)**—RICHARD P. COOPER, Ashlyns, Berkhamsted, born Mar.
1330 **R. N. & H. C.**—THOMAS FENN, Stonebrook House, Ludlow, born Mar.
H. C.—DAVID BUTTAR, for No. 1327; RICHARD P. COOPER, for No. 1329; W. F. INGE, for No. 1335.
Com.—W. F. INGE, for No. 1336; ALFRED TANNER, for No. 1340.

Class 161.—*Pens of Three Shropshire Ewe Lambs.* [13 entries, 2 absent.]

1350 **I. (£10.)**—ANDREW E. MANSELL, Harrington Hall, Shifnal, born Feb.
1351 **II. (£5.)**—PHILO L. MILLS, Ruddington Hall, Notts., born Feb.
1346 **R. N. & H. C.**—JOHN HARDING, Norton House, Shifnal.
H. C.—MRS. MARIA BARRS, for No. 1341; DENSTON GIBSON, for No. 1345; G. L. FOSTER HARTER, for No. 1347; HUBERT C. G. PARKER, for No. 1352; ALFRED TANNER, for No. 1353.
1342 **Com.**—ARTHUR BRADBURNE.

Southdowns.

Class 162.—*Southdown Two-Shear Rams.* [21 entries, 3 absent.]

1370 **I. (£15, & Champion.[1])**—THE DUKE OF RICHMOND AND GORDON, K.G., Goodwood, Chichester, born Feb.
1373 **II. (£10.)**—WILLIAM TOOP, Westergate, Chichester, born Feb. 21.
1356 **III. (£5)**, & 1358 **R. N. & H. C.**—C. R. W. ADEANE, Babraham Hall, Cambridge, born Feb.
Com.—EARL CADOGAN, K.G., for No. 1361; EXORS. OF J. J. COLMAN, for No. 1362; EDWIN ELLIS, for No. 1365.

Class 163.—*Southdown Shearling Rams.* [34 entries, 4 absent.]

1381 **I. (£15, & R. N. for Champion.[1])**—SIR JAMES BLYTH, BT., Blythwood, Stansted, born Feb.

[1] A Champion Prize of Ten Guineas, given by the Southdown Sheep Society for the best Southdown Ram in Classes 162 and 163.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1377 **II.** (£10.) & 1379 **R. N. & H. C.**—C. R. W. Adeane, Babraham Hall, Cambridge, born Feb.

1396 **III.** (£5.)—Pagham Harbour Co., Selsey, Chichester, born Feb.
Com.—H.R.H. The Prince of Wales, K.G., for No. 1375; Earl Bathurst, for No. 1380; The Pagham Harbour Co., for No. 1397; William Toop, for No. 1406.

Class 164.—*Pens of Three Southdown Ram Lambs.* [19 entries, 1 absent.]

1425 **I.** (£15.)—Pagham Harbour Co., Selsey, Chichester, born Feb.
1410 **II.** (£10.)—C. R. W. Adeane, Babraham Hall, Cambridge, born Feb.
1426 **III.** (£5.)—William Toop, Westergate, Chichester, born Feb.
1427 **R. N. & H. C.**—Whitaker Wright, Lea Park, Godalming, born Feb. S.
Com.—Exors. of J. J. Colman, for No. 1414; Edwin Ellis, for No. 1417; Alfred Heasman, for No. 1420; H. L. B. McCalmont, M.P., for No. 1422.

Class 165.—*Pens of Three Southdown Ewes, other than Shearling, of the same Flock.*[1] [5 entries, none absent.]

1431 **I.** (£15.)—Pagham Harbour Co., Selsey, Chichester.
1428 **II.** (£10.)—Earl Bathurst, Cirencester Park, Glos., born Feb. 1894.
1432 **R. N. & H. C.**—William Toop, Westergate, Chichester.
1429 **H. C.**—H. L. B. McCalmont, M.P.

Class 166.—*Pens of Three Southdown Shearling Ewes, of the same Flock.* [15 entries, 2 absent.]

1434 **I.** (£15.)—Earl Bathurst, Cirencester Park, Glos., born Feb.
1440 **II.** (£10.)—Exors. of J. J. Colman, Carrow House, Norwich, born Feb.
1438 **III.** (£5.)—Earl Cadogan, K.G., Culford Hall, Bury St. Edmunds, born Feb.

1435 **R. N. & H. C.**—Sir James Blyth, Bt., Blythwood, Stansted.
H. C.—H.R.H. The Prince of Wales, K.G., for No. 1433; Pagham Harbour Co., for No. 1444.
Com.—Sir James Blyth, Bt., for No. 1436; Sir William Throckmorton, Bt., for No. 1446.

Class 167.—*Pens of Three Southdown Ewe Lambs.* [20 entries, 6 absent.]

1464 **I.** (£15.)—Pagham Harbour Co., Selsey, Chichester, born Feb.
1466 **II.** (£10.)—William Toop, Westergate, Chichester, born Feb.
1461 **III.** (£5.)—Harry L. B. McCalmont, M.P., Cheveley Park, Newmarket, born Feb.

1462 **R. N. & H. C.**—Thomas Miles, Buckwell, Wye, Ashford, born Feb.
H. C.—W. P. Hampton, for No. 1458; Alfred Heasman, for No. 1459.
Com.—George Courtauld, for No. 1454; Edwin Ellis, for No. 1457.

---

[1] Prizes given by the Maidstone Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Hampshire Downs.

Class 168.—*Hampshire Down Two-Shear Rams.* [7 entries, 3 absent.]

1472 I. (£10.)—R. W. Hudson, Danesfield, Gt. Marlow, Bucks, for Col d'Arbres No. 11, born Jan 20, bred by A. de Mornay, Col d'Arbres, Wallingford.

1469 II. (£5.)—T. Fowell Buxton, Waters Place, Ware, Herts, born Jan. 14.
1468 R. N.—Lloyd H. Baxendale, Greenham Lodge, Newbury, Berks.

Class 169.—*Hampshire Down Shearling Rams.* [17 entries, 4 absent.]

1482 I. (£15.)—James Flower, Chilmark, Salisbury, born Jan.
1481 II. (£10.)—Cary Coles, Manor House, Winterbourne Stoke, Salisbury, born Jan. 21.

1477 III. (£5.)—T. Fowell Buxton, Waters Place, Ware, born Jan. 23.
1479 R. N. & H. C.—The Earl of Carnarvon, Highclere Castle, Newbury.
1486 H. C.—Lord Rothschild. 1476 Com.—T. Fowell Buxton.

Class 170.—*Pens of Three Hampshire Down Ram Lambs.* [12 entries, 5 absent.]

1499 I. (£10.)—James Flower, Chilmark, Salisbury, born Jan.
1508 II. (£5.)—Henry C. Stephens, M.P., Cholderton, Salisbury, born Jan.
1494 R. N. & H. C.—T. Fowell Buxton, Waters Place, Ware, Herts.
H. C.—The Earl of Carnarvon, for No. 1497; Cary Coles, for No. 1498; Lord Rothschild, for No. 1506.
Com.—Lloyd H. Baxendale, for No. 1492; H. N. Carlisle, for No. 1496; Alexander Henderson, M.P., for No. 1503.

Class 171.—*Pens of Three Hampshire Down Shearling Ewes, of the same Flock.* [5 entries, none absent.]

1513 I. (£15.)—R. W. Hudson, Danesfield, Great Marlow, Bucks, born Jan. 15, bred by A. de Mornay, Col d'Arbres, Wallingford.

1517 II. (£10.)—Henry C. Stephens, M.P., Cholderton, Salisbury, born Jan.
1518 R. N. & H. C.—W. T. Twidell, Mays Farm, Crowmarsh, Wallingford.
1514 H. C.—John Joyce, Milverton, Somerset.

Class 172.—*Pens of Three Hampshire Down Ewe Lambs.* [17 entries, 5 absent.]

1521 I. (£10.)—T. Fowell Buxton, Waters Place, Ware, Herts, born Jan.
1524 II. (£5.)—James Flower, Chilmark, Salisbury, born Jan.
1522 R. N & H. C.—The Earl of Carnarvon, Highclere Castle, Newbury.
H. C.—Lloyd H. Baxendale, for No. 1519; Cary Coles, for No. 1523; Alexander Henderson, M.P., for No. 1528; Lord Rothschild, for No. 1531.
Com.—J. Bonham Carter, for No. 1520; Basil Hanbury, for No. 1527; R. W. Hudson, for No. 1529; Henry C. Stephens, M.P., for No. 1533; W. T. Twidell, for No. 1534.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Suffolks.

Class 173.—*Suffolk Two-Shear Rams.* [4 entries, none absent.]

1536 I. (£10, & R. N. for Champion.[1])—THE EARL OF ELLESMERE, Stetchworth Park, Newmarket, born Feb.

1538 II. (£5.)—H. L. B. MCCALMONT, M.P., Cheveley Park, Newmarket, for **Cheveley Squire 5th** 4620, bred by Slater Bros., Cheveley Hall, Newmarket; *s.* Cheveley Squire 2nd 4028.

1539 R. N.—H. L. B. MCCALMONT, M.P., Newmarket, for **Thistle.**

Class 174.—*Suffolk Shearling Rams.* [9 entries, 1 absent.]

1541 I. (£15, & Champion[1]), 1542 III. (£5), & 1543 R. N. & H. C.—THE EARL OF ELLESMERE, Stetchworth Park, Newmarket, born Feb.

1547 II. (£10.)—HERBERT E. SMITH, The Grange, Walton, Suffolk, born Feb., bred by Joseph Smith, The Grange, Walton.

1540 H. C.—THE MARQUIS OF BRISTOL, for **Bonner.**
Com.—THOMAS GOODCHILD, for No. 1544, **Gunces Boy**; HERBERT E. SMITH, for No. 1548.

Class 175.—*Pens of Three Suffolk Ram Lambs.* [12 entries, 1 absent.]

1559 I. (£10.)—HERBERT E. SMITH, The Grange, Walton, Suffolk, born Feb.
1551 II. (£5.)—THE EARL OF ELLESMERE, Stetchworth Park, Newmarket, born Feb.

1556 R. N. & H. C.—ARTHUR PALEY, Ampton Hall, Bury St. Edmunds, born Jan. and Feb.
H. C.—J. W. EAGLE, for No. 1550; D. ABBOTT GREEN, for No. 1553; S. R. SHERWOOD, for No. 1557.
1555 Com.—H. L. B. MCCALMONT, M.P.

Class 176.—*Pens of Three Suffolk Shearling Ewes, of the same Flock.* [8 entries, none absent.]

1563 I. (£15), & 1564 III. (£5.)—THE EARL OF ELLESMERE, Stetchworth Park, Newmarket, born Feb.

1566 II. (£10.)—HERBERT E. SMITH, The Grange, Walton, Suffolk, born Feb., bred by Joseph Smith, The Grange, Walton.

1562 R. N. & H. C.—THE MARQUIS OF BRISTOL, Ickworth Park, Bury St. Edmunds, born Feb. 5.
1565B H. C.—S. R. SHERWOOD, Playford, Ipswich.
Com.—HENRY LINGWOOD, for No. 1565; S. R. SHERWOOD, for No. 1565A.

Class 177.—*Pens of Three Suffolk Ewe Lambs.* [11 entries, 1 absent.]

1576 I. (£10.)—HERBERT E. SMITH, The Grange, Walton, Suffolk, born Feb.
1575 II. (£5.)—S. R. SHERWOOD, Playford, Ipswich, born Feb.
1568 R. N. & H. C.—J. W. EAGLE, The Hall, Walton-on-Naze, Essex, born Jan.

---

[1] Gold Medal, given by the Suffolk Sheep Society for the best Suffolk Ram in Classes 173 and 174.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

H. C.—D. ABBOTT GREEN, for No. 1571; H. L. B. McCALMONT, M.P., for No. 1573.

Com.—THE EARL OF ELLESMERE, for No. 1569; THOMAS GOODCHILD, for No. 1570.

Border Leicesters.

Class 178.—*Border Leicester Two-Shear Rams.* [4 entries, 1 absent.]

1579 I. (£10.)—J. E. NICHOLSON, Manor House, Lanchester, Durham, born Mar. 10, bred by Joseph Lee, Markle, Prestonkirk, N.B.

1581 II. (£5.)—THOMAS WINTER, Springfield House, Sherburn, Yorks, born Mar.

1578 R. N.—THE RT. HON. A. J. BALFOUR, M.P., Whittinghame, Prestonkirk.

Class 179.—*Border Leicester Shearling Rams.* [13 entries, none absent.]

1591 I. (£15), & 1592 II. (£10.)—JOHN TWENTYMAN, Hawkrigg House, Wigton, Cumberland, born Mar.

1587 III. (£5.)—J. E. NICHOLSON, Manor House, Lanchester, Durham, born Mar. 18.

1583 R. N. & H. C.—THE RIGHT HON. A. J. BALFOUR, M.P., Whittinghame, Prestonkirk, N.B., born Mar.

Com.—THE RT. HON. A. J. BALFOUR, M.P., for No. 1582; THOMAS WINTER, for No. 1593.

Class 180.—*Pens of Three Border Leicester Shearling Ewes, of the same Flock.* [7 entries.]

1598 I. (£15.)—J. E. NICHOLSON, Manor House, Lanchester, Durham, born Mar.

1595 II. (£10.)—THE RIGHT HON. A. J. BALFOUR, M.P., Whittinghame, Prestonkirk, N.B., born Mar.

1600 III. (£5.)—JOHN TWENTYMAN, Hawkrigg House, Wigton, born Mar.

1596 R. N. & H. C.—GEORGE LAING, New Etal, Cornhill-on-Tweed.

1597 H.C.—GEORGE LAING.

Com.—ROBERT TAYLOR, for No. 1599; THOMAS WINTER, for No. 1601.

Kentish or Romney Marsh.

Class 181.—*Kentish or Romney Marsh Rams, Two-Shear and upwards.* [15 entries, 2 absent.]

1609 I. (£15, & Champion.[1])—WILLIAM MILLEN, Syndale Valley, Faversham, Kent, for **Darlington 64th**, born Apr. 6, 1897; *s.* Royal Darlington 1st 220.

1610 II. (£10, & R. N. for Champion.[1])—WILLIAM MILLEN, for **Syndale 7th**, born Apr. 6, 1895.

1605 III. (£5.)—CHARLES FILE, Elham, Canterbury, for **Jumbo 16th** 4824, born Apr. 1, 1897; *s.* Jumbo Junior 610.

---

[1] Prize of £15 given by the Maidstone Local Committee for the best Kentish Ram in Classes 181 and 182.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1616 **R. N. & H. C.**—HENRY RIGDEN, Lyminge, Hythe, born Apr. 16, 1897.
1611 **H. C.**—WILLIAM MILLEN, born Apr. 5, 1896.
1606 **Com.**—J. S. S. GODWIN, for **Hazlewood 2nd.**

Class 182.—*Kentish or Romney Marsh Shearling Rams.* [30 entries, 5 absent.]

1633 **I.** (£15.)—WILLIAM MILLEN, Syndale Valley, Faversham, born Mar. 30.
1628 **II.** (£10.)—J. S. S. GODWIN, Hazlewood, Hadlow, Tonbridge, born Apr.; *s.* Amos 13th 3752.
1638 **III.** (£5.)—LEWIS H. PAGE, Bobbing Court, Sittingbourne, born Mar. 8.
1626 **R. N. & H. C.**—CHARLES FILE, Elham, Canterbury, for **Jumbo 33rd.**
1634 **Com.**—WILLIAM MILLEN.

Class 183.—*Pens of three Kentish or Romney Marsh Ram Lambs.*[1] [8 entries, none absent.]

1654 **I.** (£10.)—HENRY RIGDEN, Lyminge, Hythe, Kent, born Mar. 20.
1648 **II.** (£5.)—J. S. S. GODWIN, Hazlewood, Hadlow, Tonbridge, born Apr. 1 *ss.* Hazlewood 2nd, 10th and Amos 13th 97.
1650 **R. N. & H. C.**—WILLIAM MILLEN, Faversham, born Apr. 2.

Class 184.—*Pens of Three Kentish or Romney Marsh Ewes, other than Shearling, of the same Flock.*[1] [7 entries, none absent.]

1661 **I.** (£15, & **Champion**[2]), & 1660 **III.** (£5.)—HENRY RIGDEN, Lyminge, Hythe, Kent, born Apr., 1896.

1656 **II.** (£10.)—FREDERICK BAKER, Manor Farm, Frindsbury, Rochester, born Mar.; *s.* Eastboro 419.

1658 **R. N. & H. C.**—FREDERICK NEAME, Macknade, Faversham.

Class 185.—*Pens of Three Kentish or Romney Marsh Shearling Ewes, of the same Flock.* [16 entries, none absent.]

1673 **I.** (£15, & **R. N. for Champion.**[2])—HENRY RIGDEN, Lyminge, Hythe, Kent, born Apr.

1669 **II.** (£10), & 1670 **R. N. & H. C.**—FREDERICK NEAME, Macknade, Faversham, born Mar.

1666 **III.** (£5.)—WILLIAM MILLEN, Syndale Valley, Faversham, born Apr. 4.
1663 **H. C.**—CHARLES FILE, Elham, Canterbury.
Com.—GEORGE FARMER, for No. 1662; WILLIAM MILLEN, for No. 1667.

Class 186.—*Pens of Three Kentish or Romney Marsh Ewe Lambs.*[1] [10 entries, none absent.]

1681 **I.** (£10), & 1680 **II.** (£5.)—WILLIAM MILLEN, Syndale Valley, Faversham, born Mar.
1679 **R. N. & H. C.**—J. S. S. GODWIN, Hazlewood, Hadlow, Tonbridge.
1678 **Com.**—ALFRED AMOS.

---

[1] Prizes given by the Maidstone Local Committee.
[2] Prize of £15 given by the Maidstone Local Committee for the best Pen of Three Kentish Ewes in Classes 184 and 185.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Wensleydales.

Class 187.—*Wensleydale Two-Shear or Shearling Rams.* [9 entries, none absent.]

1688 I. (£10.)—John H. Calvert, Sunnyside, Masham, R.S.O., Yorks., born Mar. 28, 1898; *s.* Choice 600, *d. by* Eton 326.
1692 II. (£5.)—John Heugh, Mudd Fields, Bedale, born Mar. 12, 1898 *s.* Crakehall 604, *d. by* Indian Chief 383.
1693 **R. N. & H. C.**—J. Rhodes, for **Stockeld 3rd.**
1695 **Com.**—Exors. of the late Thomas Willis, for **Royal Record.**

Class 188.—*Pens of Three Wensleydale Shearling Ewes, of the same Flock.* [3 entries.]

1699 I. (£10.)—The Exors. of the late Thomas Willis, Manor House, Carperby, Aysgarth, R.S.O., Yorks., born Mar. 18, 24, and 27; *s.* Royal Manchester 458, *ds. by* Confidence 292 and Heir of the Valley 259.
1698 II. (£5.)—J. Rhodes, Lodge Farm, Stockeld, Wetherby, Yorks., born Mar.
1697 **R. N. & H. C.**—John Heugh, Mudd Fields, Bedale, Yorks.

Devon Long-Woolled.

Class 189.—*Devon Long-Woolled Two-Shear or Shearling Rams.* [8 entries, none absent.]

1704 I. (£10.)—C. Giles Thorne, Curdon, Williton, Somerset, born Feb. 1897.
1702 II. (£5.)—Alfred C. Skinner, Pound Farm, Bishop's Lydeard, Somerset, born Feb., 1898.
1701 **R. N. & H. C.**—Robert Cook, Chevithorne, Tiverton, born Feb., 1897.
1705 **H. C.**—C. Giles Thorne.
Com.—Alfred C. Skinner, for No. 1703; Frederick White, for No. 1707.

Class 190.—*Pens of Three Devon Long-Woolled Shearling Ewes, of the Same Flock.* [3 entries.]

1708 I. (£10.)—Robert Cook, Chevithorne, Tiverton, Devon, born Feb.
1710 II. (£5.)—Frederick White, Torweston, Williton, Somerset, born Feb.; *s.* Torweston Magnum Bonum.
1709 **R. N. & H. C.**—C. Giles Thorne, Curdon, Williton, Somerset, born Feb.

Somerset and Dorset Horned.

Class 191.—*Somerset and Dorset Horned Shearling Rams.* [2 entries, none absent.]

1712 I. (£10.)—William Reginald Flower, West Stafford, Dorchester, for **Flower's No. 61**, born Jan. 17, 1898; *s.* Flower's No. 51 938.

Class 192.—*Pens of Three Somerset and Dorset Horned Shearling Ewes, of the same Flock, dropped after November* 1, 1897. [2 entries.]

1714 I. (£10), & 1713 II. (£5.)—William Reginald Flower, West Stafford, Dorchester, born Dec. 3, 1897; *s.* Flower's No. 51 938.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Cheviots.

Class 193.—*Cheviot Two-Shear or Shearling Rams.* [4 entries.]

1715 I. (£10.)—JACOB ROBSON, Byrness, Otterburn, Northumberland, born Apr., 1897.
1718 II. (£5), & 1717 R. N. & H. C.—JOHN ROBSON, Newton, Bellingham, Northumberland, born Apr., 1897.
1716 H. C.—JACOB ROBSON, Byrness, Otterburn.

Class 194.—*Pens of Three Cheviot Shearling Ewes, of the same Flock.* [4 entries, 1 absent.]

1721 I. (£10.)—JOHN ROBSON, Newton, Bellingham, Northumb., born Apr.
1719 II. (£5), & 1720 R. N. & H. C.—JACOB ROBSON, Byrness, Otterburn, Northumb., born Apr.

Black-Faced Mountain.

Class 195.—*Black-Faced Mountain Two-Shear or Shearling Rams.* [5 entries, none absent.]

1724 I. (£10.)—THOMAS RAWLINSON, Park House, Kirkby Lonsdale, born Apr., 1898; *s.* Avon's Model, *d.* Woolford's Ewe.
1723 II. (£5.)—TOM IRVING, The Crew, Bewcastle, Brampton, Cumberland, for **Crew Prince**, born Apr. 14, 1898; *s.* Avondale, *d.* Princess.
1727 R. N. & H. C., & 1726 Com.—JOHN ROBSON, Newton, Bellingham, Northumberland, born Apr., 1898.

Class 196.—*Pens of Three Black-Faced Mountain Shearling Ewes, of the same Flock.* [4 entries, 1 absent.]

1730 I. (£10.)—TOM IRVING, The Crew, Bewcastle, Brampton, born Apr. 3, 9, and 24, bred by Thomas Dargue, Burnside Hall, Kendal.
1731 II. (£5.)—JOHN ROBSON, Newton, Bellingham, Northumb., born Apr.
1729 R. N. & H. C.—TOM IRVING, Bewcastle, born Apr. 7, 10 and 18.

Herdwicks.

Class 197.—*Herdwick Two-Shear or Shearling Rams.* [1 entry, absent.]

Class 198.—*Pens of Three Herdwick Shearling Ewes, of the same Flock.* [1 entry.]

1733 I. (£10.)—WILLIAM LEATHES, Wern Fawr, Ruthin, Denbighshire, born Mar. and Apr.

Welsh Mountain.

Class 199.—*Welsh Mountain Two-Shear or Shearling Rams.* [2 entries.]

1734 I. (£10.)—J. MARSHALL DUGDALE, Llwyn, Llanfyllin, Mont., for **Hero 2nd**, born Mar. 1897.
1735 II. (£5.)—OWEN PRICE, Nantyrharn, Cray, Brecon, for **Llewelyn**, born Mar. 10, 1897.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 200.—*Pens of Three Welsh Mountain Shearling Ewes, of the same Flock.* [3 entries.]

1736 I. (£10), & 1737 II. (£5.)—J. MARSHALL DUGDALE, Llwyn, Llanfyllin, Mont., born Mar.

1738 **R. N. & H. C.**—JOSEPH L. GRATTON, Foryd Fawr Farm, Abergele, Denbighshire, born Feb. 15, Mar. 8 and 28.

PIGS.

Large White Breed.

Class 201.—*Large White Boars, farrowed in* 1897 *or* 1898. [10 entries, none absent.]

1742 I. (£10, & **Champion.**[1])—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Walton Eclipse II.**, born Jan. 14, 1897; *s.* Walton Eclipse 3621, *d.* Walton Duchess II. 6782 *by* Walton Captain 3171.

1744 II. (£5.)—PHILO L. MILLS, Ruddington Hall, Notts., born June 30, 1898; *s.* Sandow 4783, *d.* Ruddington Duchess VIII. 7474 *by* Ruddington King David VIII. 4031.

1743 III. (£3.)—PHILO L. MILLS, Ruddington Hall, for **Saint Peter**, born June 10, 1897; *s.* Saint Simon 4399, *d.* Miss Wood XLIV. 8098 *by* Ruddington Champion 4025.

1746 **R. N. & Com.**—SANDERS SPENCER, for **Holywell Royalty II.**

Class 202.—*Pens of Three Large White Boar Pigs, farrowed in* 1899. [13 entries, 1 absent.]

1750 I. (£10.)—D. R. DAYBELL, Bottesford, Nottingham, born Jan. 8; *s.* Bottesford Rufford 3903, *d.* Bottesford Queen 7240 *by* Borrowfield Ringleader 2631.

1752 II. (£5.)—D. R. DAYBELL, Bottesford, born Jan. 8; *s.* Bottesford Rufford 3903, *d.* Bottesford Queen 7240 *by* Borrowfield Ringleader 2631.

1753 III. (£3.)—THOMAS DIGGLE, Thorpe House, Ewerby, Sleaford, born Jan. 3; *s.* Holywell Cork 4691, *d.* Ewerby Duchess *by* Ruddington King David VIII. 4031.

1760 **R. N.**—SANDERS SPENCER, Holywell Manor, St. Ives, Hunts.

Class 203.—*Large White Breeding Sows, farrowed in* 1897 *or* 1898. [10 entries, 2 absent.]

1763 I. (£10.)[2]—D. R. DAYBELL, Bottesford, Nottingham, for **Bottesford Satisfaction**, born Feb. 1, 1897 [farrowed Aug. 26, 1899]; *s.* Bottesford Rufford 3903, *d.* Bottesford Belle 5042 *by* Cestrian Ranger 2639.

1764 II. (£5.)—SIR GILBERT GREENALL, BT., Walton Hall, for **Walton Bella** 8204, born Jan. 12, 1897 [farrowed July 4, 1899]; *s.* Walton What's Wanted 4067, *d.* Walton Belle III. 6778 *by* Walton Eclipse 3621.

1769 III. (£3.)—PHILO L. MILLS, Ruddington Hall, Notts, for **Miss Hollingworth LXXVII.**, born May 22, 1897 [farrowed July 4, 1899]; *s.* Ruddington Champion II. 4027, *d.* Miss Hollingworth LVII. by Ruddington King David V. 3143.

---

[1] Gold Medal, value Five Guineas, given by the National Pig Breeders' Association for the best Large White Boar or Sow in Classes 201 and 203.

[2] Nos. 1763, 1764, 1769, 1804 (Champion), 1813, 1811, 1812 have succeeded to their present positions by the disqualification, through non-compliance with the Regulation as to farrowing before September 1, of No. 1766 (First Prize in Class 203), and of No. 1809 (First Prize in Class 211, and Champion).

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 204.—*Pens of Three Large White Sow Pigs, farrowed in* 1899.
[10 entries, 2 absent.]

1780 **I.** (£10.)—SANDERS SPENCER, Holywell Manor, St. Ives, Hunts., born Jan. 10; *s.* Holywell Dismal Jimmy 3511, *d.* Holywell Star *by* Holywell Dublin 2681.

1777 **II.** (£5.)—PHILO L. MILLS, Ruddington Hall, Notts., born Jan. 5; *s.* Duke of Rutland, *d.* Miss Hollingworth LXXVII. *by* Ruddington Champion II. 4027.

1773 **III.** (£3.)—D. R. DAYBELL, Bottesford, Nottingham, born Jan. 1 and 8; *ss.* Holywell Bottesford 4689 and Bottesford Rufford 3903, *ds.* Bottesford Expectation 7930 *by* Bottesford King 3019, and Bottesford Queen 7240 *by* Borrowfield Ringleader 2631.

1775 **R. N. & Com.**—SIR GILBERT GREENALL, BT., Walton Hall, Warrington

Middle White Breed.

Class 205.—*Middle White Boars, farrowed in* 1897 *or* 1898.
[6 entries, 1 absent.]

1782 **I.** (£10.)—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Walton Royal**, born Jan. 20, 1898; *s.* Walton Victor 4501 *d.* Walton Mayflower III. 6128 *by* Badger 2845.

1787 **II.** (£5.)—ALFRED C. TWENTYMAN, Castlecroft, Wolverhampton, for **Castlecroft Quicklime**, born July 25, 1897; *s.* Quicksilver 1535 *d.* Castlecroft Lady Leicester 7590 *by* Morden Pure Gold 3253.

1785 **III.** (£3.)—SANDERS SPENCER, Holywell Manor, St. Ives, Hunts., for **Holywell Georgie**, born May 29, 1898; *s.* Holywell John Bull 4867 *d.* Holywell Christmas Box *by* Holywell Stumpy Tail 4479.

1784 **R. N. & Com.**—SANDERS SPENCER, for **Holywell Count Arthur.**

Class 206.—*Pens of Three Middle White Boar Pigs, farrowed in* 1899.
[3 entries.]

1788 **I.** (£10.)—SANDERS SPENCER, Holywell Manor, St. Ives, Hunts., born Jan. 14; *s.* Holywell Stumpy Tail 4479, *d.* Holywell Rosy Girl *by* Holywell Count 3239.

1789 **II.** (£5.)—SANDERS SPENCER, Holywell Manor, born Jan. 21; *s.* Holywell John Bull 4867, *d.* Holywell Victrix *by* Holywell Count 3239.

1790 **R. N.**—ALFRED C. TWENTYMAN, Castlecroft, Wolverhampton.

Class 207.—*Middle White Breeding Sows, farrowed in* 1897 *or* 1898.
[9 entries, none absent.]

1794 **I.** (£10, & **Champion.**[1])—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Walton Mayflower IV.**, born July 13, 1897 [farrowed Aug. 25, 1899]; *s.* Walton Major 3695, *d.* Walton Mayflower 6124 *by* Badger 2845.

1792 **II.** (£5, & **R. N. for Champion.**[1])—SIR GILBERT GREENALL, BT., Walton Hall, for **Walton Bridesmaid**, born July 26, 1897 [farrowed Aug. 16, 1899]; *s.* Walton Editor 4499, *d.* Walton Mayflower II. 6126 *by* Badger 2845.

1793 **III.** (£3.)—SIR GILBERT GREENALL, BT., Walton Hall, for **Walton Rose IX.**, born Nov. 26, 1897 [farrowed Aug. 8, 1899]; *s.* Walton Editor 4499, *d.* Walton Rose II. 6928 *by* Walton Major 3695.

[1] Gold Medal, value Five Guineas, given by the National Pig Breeders' Association for the best Middle White Boar or Sow in Classes 205 and 207.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1797 R. N. & H. C.—SANDERS SPENCER, for **Holywell Victoria Countess.**

1798 Com.—ALFRED C. TWENTYMAN, for **Castlecroft Lavender.**

Class 208.—*Pens of Three Middle White Sow Pigs, farrowed in* 1899 [4 entries, 1 absent.]

1801 I. (£10.)—SANDERS SPENCER, Holywell Manor, St. Ives, Hunts., born Jan. 14; *s.* Holywell Stumpy Tail 4479, *d.* Holywell Rosy Girl *by* Holywell Count 3239.

1802 II. (£5.)—SANDERS SPENCER, Holywell Manor, born Jan. 21; *s.* Holywell John Bull 4867, *d.* Holywell Victrix *by* Holywell Count 3239.

1803 R. N.—ALFRED C. TWENTYMAN, Castlecroft, Wolverhampton.

Small White Breed.

Class 209.—*Small White Boars, farrowed in* 1897 *or* 1898. [4 entries.]

1804 I. (£10, & Champion.[1])[2]—THE HON. D. P. BOUVERIE, Coleshill House, Highworth, Wilts., for **Coleshill Emperor II.**, born Jan. 1, 1898; *s.* Coleshill Edward 4509, *d.* Coleshill Empress 5444 *by* King William 2097.

1805 II. (£5.)—THE HON. D. P. BOUVERIE, Highworth, for **Coleshill President**, born Jan. 2, 1897; *s.* Coleshill Dick 4505, *d.* Coleshill Princess 6942 *by* Coleshill Joe 2885.

1807 III. (£3.)—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Walton Robin**, born Mar. 25, 1898, bred by Lord Amherst of Hackney, Didlington Hall, Brandon; *s.* Christopher 3701, *d.* Susie 7704 *by* Coleshill Chancellor 3265.

1806 R. N. & Com.—SIR GILBERT GREENALL, BT., for **Walton Peacock.**

Class 210.—*Pen of Three Small White Boar Pigs, farrowed in* 1899. [1 entry.]

1808 I. (£10.)—THE HON. D. P. BOUVERIE, Coleshill House, Highworth, Wilts., born Jan. 3; *s.* Coleshill Dick 4505, *d.* Coleshill Sarah 4206 *by* Coleshill Farmer 2093.

Class 211.—*Small White Breeding Sows, farrowed in* 1897 *or* 1898. [5 entries, 1 absent.]

1813 I. (£10.)[2]—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Walton Tiny III.** 8372, born Feb. 12, 1897 [farrowed July 4, 1899]; *s.* Temple Champion 4179, *d.* Walton Tiny 7706 *by* Prescot 2897.

1811 II. (£5.)—THE HON. D. P. BOUVERIE, Highworth, born Oct. 19, 1897 [farrowed Aug. 4, 1899]; *s.* Coleshill Temple Victor 4525, *d.* Coleshill Susan II. 5460 *by* King William 2097.

1812 III. (£3.)—SIR GILBERT GREENALL, BT., for **Walton Tiny II.** 8370, born Feb. 12, 1897 [farrowed July 26, 1899]; *s.* Temple Champion 4179, *d.* Walton Tiny 7706 *by* Prescott 2897.

---

[1] Gold Medal, value Five Guineas, given by the National Sheep-Breeders' Association for the best Small White Boar or Sow in Classes 209 and 211.

[2] See footnote on p. cxlviii.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 212.—*Pens of Three Small White Sow Pigs, farrowed in* 1899. [2 entries.]

1814 I. (£10.)—The Hon. D. P. Bouverie, Coleshill House, Highworth, Wilts., born Jan. 3; *s.* Coleshill Dick 4505, *d.* Coleshill Sarah 4206 *by* Coleshill Farmer 2093.

1815 II. (£5.)—The Hon. D. P. Bouverie, Highworth, born Jan 3; *s.* Coleshill Dick 4505, *d.* Coleshill Sarah 4206 *by* Coleshill Farmer 2093.

Berkshire Breed.

Class 213.—*Berkshire Boars, farrowed in* 1897 *or* 1898. [16 entries, 6 absent.]

1824 I. (£10, & R. N. for Champion.[1])—J. Jefferson, Peel Hall, Chester, for **Peel Charlie**, born Jan. 7, 1898, bred by C. A. Barnes, Solesbridge, Herts.; *s.* Waterloo Bob 6070, *d.* Baroness Oxford 5793 *by* Duke Agathos 5397.

1828 II. (£5.)—Russell Swanwick, R.A.C. Farm, Cirencester, for **Sambo 526**, born Dec. 1, 1897; *s.* Loyal Berks 6391, *d.* Stumpy MDXXVII. 6481 *by* Andover C. 5562.

1831 III. (£3.)—George T. Tomkin, The Moat, Marden, Kent, for **Marden Model**, born Mar. 8, 1898; *s.* Marden Duke 6155, *d.* Marden Mayblossom 6111 *by* Flordon Bart. 4775.

1823 R. N. & H. C.—J. Jefferson, Chester, for **Peel Alfred.**

1819 H. C.—The Earl of Carnarvon, for **Drogheda.**

Com.—E. J. Morant, for No. 1826, **Don José**; Russell Swanwick, for No. 1827, **College Flag.**

Class 214.—*Pens of Three Berkshire Boar Pigs, farrowed in* 1899. [10 entries, 3 absent.]

1833 I. (£10.)—Edward Burbidge, South Wraxhall, Bradford-on-Avon, born Jan. 4; *s.* Jack of all Trades 6500, *d.* Gentle Jane *by* Swansea 3751.

1836 II. (£5.)—Julius A. Fricker, Burton, Mere, Wilts., born Jan. 2; *s.* First Catch F. 5925, *d.* Bernice W. J. 5078 *by* Prime Bacon 4085.

1838 III. (£3.)—J. Jefferson, Peel Hall, Chester, born Jan. 28; *s.* Stratton Teddy 5860, *d.* Peel Duchess LIV. 5627 *by* Duke Supreme 4973.

1841 R. N. & H. C.—George T. Tomkin, The Moat, Marden, Kent, born Jan. 3.

1839 H. C.—James W. Kimber, Fyfield Wick, Abingdon, Berks.

1840 Com.—Russell Swanwick, Cirencester.

Class 215.—*Berkshire Breeding Sows, farrowed in* 1897 *or* 1898. [14 entries, 4 absent.]

1850 I. (£10, & Champion.[1])—J. Jefferson, Peel Hall, Chester, for **Peel Jessie 6698**, born Jan. 3, 1898 [farrowed Aug. 10, 1899]; *s.* Peel Surprise 5884, *d.* Peel Annie 6232 *by* Walton Turk 4712.

1848 II. (£5.)—J. Jefferson, Chester, for **Peel Daisy 6695**, born June 29, 1897, in-pig; *s.* Sir William 5574, *d.* Peel Perfection 5069 *by* Lord Cranborne 4234.

[1] Prize of £5, given by the British Berkshire Society for the best Berkshire Boar or Sow in Classes 213 and 215.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1845 **III.** (£3.)—THE EARL OF CARNARVON, Highclere Castle, Newbury, for **Highclere XXXVII.**, born Oct. 4, 1897 [farrowed July 28, 1899]; *s.* Swansea 3751, *d.* Highclere XVI. 5405 *by* Cornet 5445.

1855 **R. N. & H. C.**—GEORGE T. TOMKIN, Marden, Kent, for **Marden Millie.**
H. C.—THE EARL OF CARNARVON, for No. 1844, **Fricassee**, and for No. 1846, **Kestrel**; JULIUS A. FRICKER, for No. 1847, **Gillingham F.B.**
Com.—JOHN PITTMAN KING, for No. 1851, **Ruby XV.**, and for No. 1852.

Class 216.—*Pens of Three Berkshire Sow Pigs, farrowed in* 1899.
[9 entries, 4 absent.]

1859 **I.** (£10.)—JULIUS A. FRICKER, Burton, Mere, Wilts., born Jan. 2; *s.* First Catch F. 5925, *d.* Bright XII. *by* Highmere 4750.

1857 **II.** (£5.)—EDWARD BURBIDGE, South Wraxhall, Bradford-on-Avon, born Jan. 20; *s.* Jack of all Trades 6500, *d.* Fair Maid *by* Swansea 3751.

1864 **III.** (£3.)—RUSSELL SWANWICK, R.A.C. Farm, Cirencester, born Jan. 10; *s.* Noble 6486, *d.* Sollie 918 *by* Loyal Berks 6391.

1861 **R. N. & H. C.**—J. JEFFERSON, Peel Hall, Chester, born Jan. 4.
1863 **Com.**—RUSSELL SWANWICK.

Tamworth Breed.

Class 217.—*Tamworth Boars, farrowed in* 1897 *or* 1898.
[4 entries.]

1868 **I.** (£10.)—D. W. PHILIP, The Ashes, Whitacre, Coleshill, Warwickshire, for **Whitacre Welshman**, born Aug. 10, 1897, bred by Colonel Herbert, Llanarth Court, Raglan; *s.* Whitacre General 4259, *d.* Bella 4856 *by* Whitacre Prince 2587.

1865 **II.** (£5.)—ROBERT IBBOTSON, The Hawthorns, Knowle, Warwickshire, for **Knowle King III.** 4945, born Jan. 10, 1897; *s.* Warwickshire Monarch 4597, *d.* Warwickshire Lady 6434 *by* Whitacre Goldfinder 2973.

1867 **R. N. & H. C.**—JOHN NORMAN, Cliff House, Tamworth, for **Cliff Clipper.**
1866 **H. C.**—ROBERT IBBOTSON.

Class 218.—*Pens of Three Tamworth Boar Pigs, farrowed in* 1899.
[5 entries.]

1869 **I.** (£10.)—ROBERT IBBOTSON, The Hawthorns, Knowle, Warwickshire, born Jan. 8, bred by Mrs. E. Ibbotson, Gun Hill, Arley, Coventry; *s.* Knowle Red Monarch 4953, *d.* Gun Hill Gem 8122 *by* Knowle Red Duke 4579.

1871 **II.** (£5.)—D. W. PHILIP, The Ashes, Whitacre, Coleshill, Warwickshire, born Jan. 1; *s.* Whitacre Welshman, *d.* Whitacre Favourite II. *by* Cliff Crystal 4923.

1873 **III.** (£3.)—D. W. PHILIP, Whitacre, born Jan. 3; *s.* Whitacre Welshman, *d.* Whitacre Countess *by* Cliff Crystal 4923.

1870 **R. N. & H. C.**—ROBERT IBBOTSON, Knowle, born Jan. 18.
1872 **Com.**—D. W. PHILIP.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 219.—*Tamworth Breeding Sows, farrowed in* 1897 *or* 1898. [8 entries, 3 absent.]

1880 **I. (£10, & Champion.**[1]**)**—D. W. PHILIP, The Ashes, Whitacre, Coleshill, Warwickshire, for **Whitacre Beauty** 8526, born July 10, 1897 [farrowed July 15, 1899]; *s.* Warwickshire Monarch 4597, *d.* Whitacre Countess II. 7828 *by* Whitacre Chief 3837.

1878 **II. (£5, & R. N. for Champion.**[1]**)**—JOHN NORMAN, Cliff House, Tamworth, for **Cliff Consort**, born Jan. 11, 1898 [farrowed July 27, 1899]; *s.* Cliff Clinker 4547, *d.* Cliff Chime 7720 *by* Cliff Traitor 3753.

1877 **III. (£3.)**—JOHN NORMAN, Tamworth, for **Cliff Charmazel**, born Aug. 30, 1897 [farrowed July 26, 1899]; *s.* Cliff Clinker 4547, *d.* Cliff Crocodile 7722 *by* Knowle Rector 3783.

1875 **R. N. & H. C.**—ROBERT IBBOTSON, for **Knowle Royal Queen.**

1874 **H. C.**—ROBERT IBBOTSON, for **Knowle Red Rose.**

Class 220.—*Pens of Three Tamworth Sow Pigs, farrowed in* 1899. [4 entries.]

1885 **I. (£10.)**—D. W. PHILIP, The Ashes, Whitacre, Coleshill, Warwickshire, born Jan. 1; *s.* Whitacre Welshman, *d.* Whitacre Favourite II. *by* Cliff Crystal 4923.

1883 **II. (£5.)**—ROBERT IBBOTSON, The Hawthorns, Knowle, born Jan. 8, bred by Mrs. E. Ibbotson, Gun Hill, Arley, Coventry; *s.* Knowle Red Monarch 4953, *d.* Gun Hill Gem 8422 *by* Knowle Red Duke 4579.

1884 **III. (£3.)**—WILLIAM NISBET, Park Gate, Stratford St. Andrew, Saxmundham, born Feb. 25; *s.* Baron Trowse, *d.* Maud *by* Duke of Hamilton.

1882 **R. N. & H. C.**—ROBERT IBBOTSON, Knowle, born Jan. 5.

POULTRY.

By "Cock," "Hen," "Drake," "Duck," "Gander," and "Goose" are meant birds hatched previous to January 1st, 1899.

By "Cockerel," "Pullet," "Young Drake," and "Duckling" are meant birds hatched in 1899, previous to June 1st.

FOWLS.

Game.

Class 221.—*Old English Game Cocks.* [17 entries, 4 absent.]

1893 **I. (30*s.*)**—W. H. LEWIS, Green Meadow, Maesyffrwd, Glam. April 1895.

1902 **II. (15*s.*)**—C. W. WILSON, The Gale, Abbey Town. Apr. 10, 1898.

1889 **III. (10*s.*)**—W. S. FLETCHER, The Beeches, Pontnewynydd, Mon. May 18, 1896.

1901 **R. N. & H. C.**—J. W. SIMPSON, "Sun Inn," Bootle, Cumberland.

1900 **H. C.**—A. K. SHEPPARD.

[1] Gold Medal, value Five Guineas, given by the National Pig Breeders' Association for the best Tamworth Boar or Sow exhibited in Classes 217 and 219.

Class 222.—*Old English Game Hens.* [12 entries, none absent.]

1912 I. (30*s.*)—A. K. SHEPPARD, 10 Main Street, Haverigg, Millom, Cumberland. 1 year.
1913 II. (15*s.*)—J. W. SIMPSON, "Sun Inn," Bootle, Cumberland. 2 years.
1914 III. (10*s.*)—C. W. WILSON, The Gale, Abbey Town. Apr. 10, 1898.
1910 R. N. & H. C.—J. D. TOOGOOD PARSONS, JUN., Tunbridge Wells.
H. C.—WM. NIXON, for No. 1907; J. D. TOOGOOD PARSONS, JUN., for No. 1909.

Class 223.—*Old English Game Cockerels.* [10 entries, 1 absent.]

1923 I. (30*s.*)—A. K. SHEPPARD, 10 Main Street, Haverigg, Millom, Cumberland.
1924 II. (15*s.*)—J. W. SIMPSON, "Sun Inn," Bootle, Cumberland. Jan. 9.
1918 III. (10*s.*)—H. COTTAM HODGSON, Foulshaw, Milnthorpe. Jan. 20.
1915 R. N. & H. C.—PHILIP A. FISHER, Crosshills, Keighley, Yorks. Jan. 8.
Com.—T. GARNER, for No. 1917; H. C. HODGSON, for No. 1919.

Class 224.—*Old English Game Pullets.* [8 entries, 1 absent.]

1925 I. (30*s.*), & 1926 II. (15*s.*)—PHILIP A. FISHER, Crosshills, Keighley. Jan. 8.
1931 III. (10*s.*)—A. K. SHEPPARD, 10 Main Street, Haverigg, Millom, Cumberland.
1928 R. N. & H. C.—H. COTTAM HODGSON, Foulshaw, Milnthorpe. Jan. 20.

Class 225.—*Indian Game Cocks.* [10 entries, 2 absent.]

1934 I. (30*s.*)—JOHN COUCH, Olday, Altarnun, Launceston.
1935 II. (15*s.*)—W. H. CRANE, Great Barr Hall, near Birmingham.
1942 III. (10*s.*)—WALTER WATERHOUSE, Starborough Castle, Edenbridge. 2 years.
1937 R. N. & H. C.—TOM HAWKEY, Wadebridge, Cornwall. Over 1 year.
H. C.—WM. BRENT, for No. 1933; JOHN FRAYN, for No. 1936; ERNEST STRIKE, for No. 1940.
1939 Com.—ALFRED STONE.

Class 226.—*Indian Game Hens.* [8 entries, 1 absent.]

1944 I. (30*s.*)—W. BRENT, Clampit, Callington, Cornwall.
1945 II. (15*s.*)—JOHN COUCH, Olday, Altarnum, Launceston.
1950 III. (10*s.*)—WALTER WATERHOUSE, Starborough Castle, Edenbridge. 2 years.
1943 R. N. & H. C.—ABBOT BROS., Thuxton, Norfolk. 1897.
1946 H. C.—GEORGE DOBLE.

Class 227.—*Indian Game Cockerels.* [8 entries, 1 absent.]

1953 I. (30*s.*)—JOHN COUCH, Olday, Altarnun, Launceston.
1954 II. (15*s.*)—JOHN FRAYN, St. Stephens, Launceston. Jan.
1958 III. (10*s.*)—ERNEST STRIKE, Hawks Tor View, Launceston.
1957 R. N. & H. C.—C. RADFORD, Winkleigh, N. Devon.
1951 H. C.—WILLIAM BRENT.

Class 228.—*Indian Game Pullets.* [8 entries, 1 absent.]

1960 I. (30*s.*)—JOHN COUCH, Olday, Altarnun, Launceston.
1966 II. (15*s.*)—ERNEST STRIKE, Hawks Tor View, Launceston.
1965 III. (10*s.*)—ALFRED STONE, Holm Farm, Wembworthy, Devon. Jan. 5
1961 R. N. & H. C.—W. H. CRANE, Great Barr Hall, near Birmingham. Jan. 2.
1959 H. C.—WILLIAM BRENT.
Com.—JOHN FRAYN for No. 1962; TOM HAWKEY, for No. 1963.

Dorkings.

Class 229.—*Coloured Dorking Cocks.* [6 entries, 2 absent.]

1971 I. (30*s.*)—HENRY MEREDITH, Biscathorpe, Lincoln.
1972 II. (15*s.*)—HERBERT REEVES, Emsworth, Hants. Mar. 1, 1898.
1968 III. (10*s.*)—A. K. CRICHTON, Estate Office, Glamis, N.B. 1898.
1967 R. N. & H. C.—ROBERT CHEESMAN, Westwell, Ashford, Kent.

Class 230.—*Coloured Dorking Hens.* [7 entries, 2 absent.]

1977 I. (30*s.*)—HERBERT REEVES, Emsworth, Hants. Jan. 1, 1896.
1978 II. (15*s.*)—GEORGE L. WARD, The Bury, Luton, Beds. 1898.
1979 III. (10*s.*)—WM. WOODS, Edwinstowe, Newark.
1974 R. N. & H. C.—R. CHEESMAN, Westwell, Ashford, Kent. 3 years.

Class 231.—*Coloured Dorking Cockerels.* [8 entries, none absent.]

1982 I. (30*s.*)—A. K. CRICHTON, Estate Office, Glamis, N.B.
1984 II. (15*s.*)—HENRY HILL, Whipton, Exeter. Jan. 2.
1986 III. (10*s.*)—H. F. & E. LOCKE KING, Okehurst, Billingshurst. Jan. 5.
1987 R. N. & H. C.—HERBERT REEVES, Emsworth, Hants. Jan. 24.

Class 232.—*Coloured Dorking Pullets.* [7 entries, 1 absent.]

1990 I. (30*s.*)—A. K. CRICHTON, Estate Office, Glamis, N.B. 5½ months.
1992 II. (15*s.*)—HENRY HILL, Whipton, Exeter. Jan. 2.
1994 III. (10*s.*)—H. F. & E. LOCKE KING, Okehurst, Billinghurst. Jan. 5.
1988 R. N. & H. C.—T. BROCKLEBANK, The Roscote, Heswall, Chester. Jan.
1993 H. C.—CAPT. G. PHIPPS HORNBY.

Class 233.—*Silver Grey Dorking Cocks.* [10 entries, 1 absent.]

2001 I. (30*s.*)—HERBERT REEVES, Emsworth, Hants. Jan. 14, 1897.
1997 II. (15*s.*)—CAPT. G. P. HORNBY, Sandley House, Gillingham. 1896.
1995 III. (10*s.*)—HON. FLORENCE M. T. AMHERST, Didlington Hall, Brandon. Jan. 2, 1898.
2004 R. N. & H. C.—WILLIAM WOODS, Edwinstowe, Newark.
H. C.—H. MEREDITH, for No. 1999; H. REEVES, for No. 2002; WILLIAM SNELL, for No. 2003.

Class 234.—*Silver Grey Dorking Hens.* [9 entries, none absent.]

2006 I. (30*s.*)—HON. FLORENCE AMHERST, Didlington Hall, Brandon. Jan. 2, 1898.
2005 II. (15*s.*)—C. AITKENHEAD, Stud Farm, Seaham Harbour. 1896.
2012 III. (10*s.*)—HERBERT REEVES, Emsworth, Hants. 1896.
2007 R. N. & H. C.—CAPT. G. P. HORNBY, Sandley House, Gillingham. 1896.
H. C.—MAJOR-GEN. C. E. LUARD, for No. 2008; H. REEVES, for No. 2011.
2013 Com.—WILLIAM WOODS.

Class 235.—*Silver Grey Dorking Cockerels.* [6 entries.]

2014 I. (30*s.*)—C. AITKENHEAD, Stud Farm, Seaham Harbour. Jan. 6.
2017 II. (15*s.*)—THOMAS RAE, Craighlaw, Kirkcowan, N.B. Jan. 16.
2016 III. (10*s.*)—CAPT. G. P. HORNBY, Sandley House, Gillingham. Jan. 27.
2019 R. N. & H. C.—HERBERT REEVES, Emsworth, Hants. Jan. 18.
H. C.—HON. FLORENCE AMHERST, for No. 2015; H. REEVES, for No. 2018.

Class 236.—*Silver Grey Dorking Pullets.* [6 entries, none absent.]

2022 I. (30*s.*)—CAPT. G. P. HORNBY, Sandley House, Gillingham. Jan. 27.
2025 II. (15*s.*)—HERBERT REEVES, Emsworth, Hants. Jan. 18.
2020 III. (10*s.*)—C. AITKENHEAD, Stud Farm, Seaham Harbour. Jan. 6.
2023 R. N. & Com.—NICKOLLS & HAMPSON, Caverley, Bridgnorth. Jan. 2.

Class 237.—*White or Cuckoo Dorking Cocks or Cockerels.* [4 entries, none absent.]

2028 I. (30*s.*), & 2027 II. (15*s.*)—O. E. CRESSWELL, Morney Cross, Hereford. Over 1 year.
2029 R. N.—J. J. G. WOODCOCK, Briston, Melton Constable. 1898.

Class 238.—*White or Cuckoo Dorking Hens or Pullets.* [4 entries, none absent.]

2032 I. (30*s.*), & 2031 R. N.—O. E. CRESSWELL, Morney Cross, near Hereford. Over 1 year.
2033 II. (15*s.*)—J. J. G. WOODCOCK, Briston, Melton Constable. 1897.

Brahmas and Cochins.

Class 239.—*Brahma Cocks.* [8 entries, 1 absent.]

2036 I. (30*s.*), & 2038 II. (15*s.*)—G. W. HENSHALL, Urmston, Manchester. Over 1 year.
2040 III. (10*s.*)—J. A. SLATTER, Hill House, Somerton, Banbury. 1898.
2034 R. N. & H. C.—P. L. BENSON, M.D., The Elms, Steeple Claydon, Winslow. Apr. 20, 1897.
2037 H. C.—G. W. HENSHALL. 2041 Com.—S. W. THOMAS.

Class 240.—*Brahma Hens.* [4 entries, 1 absent.]

2044 I. (30*s.*)—R. HOLLAND, Brahma Lodge, Buckingham. 1897.
2043 II. (15*s.*)—G. W. HENSHALL, Urmston, Manchester. Over 1 year.
2045 III. (10*s.*)—J. A. SLATTER, Hill House, Somerton, Banbury. 1898.

Class 241.—*Cochin Cocks.* [4 entries.]

2048 I. (30*s.*)—G. H. PROCTER, Flass House, Durham. 1897.
2047 II. (15*s.*)—JOSEPH PARTINGTON, The Woodlands, Lytham. 1 year.
2046 III. (10*s.*)—R. HOLLAND, Brahma Lodge, Buckingham. 1897.
2049 R. N. & H. C.—J. RIDDELL, Hazeldean, Wylde Green, Birmingham.

Class 242.—*Cochin Hens.* [5 entries, 1 absent.]

2052 I. (30*s.*)—JOSEPH PARTINGTON, The Woodlands, Lytham. 1 year.
2051 II. (15*s.*)—R. HOLLAND, Brahma Lodge, Buckingham. 1897.

Class 243.—*Brahma or Cochin Cockerels.* [6 entries, 1 absent.]

2059 I. (30*s.*)—J. A. SLATTER, Hill House, Somerton, Banbury. (Brahma.)
2056 II. (15*s.*)—R. HOLLAND, Brahma Lodge, Buckingham. (Brahma.) Jan. 3.
2057 III. (10*s.*)—R. H. LINGWOOD, Needham Market. (Cochin.) Jan. 1.
2060 R. N. & H. C.—A. T. WATTS, Gold Street, Wellingborough. (Cochin.)
2055 Com.—P. L. BENSON, M.D. (Brahma.)

Class 244.—*Brahma or Cochin Pullets.* [8 entries, 2 absent.]

2062 I. (30*s.*)—R. HOLLAND, Brahma Lodge, Buckingham. (Cochin.) Jan. 7.
2067 II. (15*s.*)—J. A. SLATTER, Hill House, Somerton, Banbury. (Brahma.)
2068 III. (10*s.*)—A. T. WATTS, Gold Street, Wellingborough. (Cochin.) Jan. 2.

2061 **R. N. & H. C.**—H. BEDFORD, St. James', Brackley. (Brahma.) Jan. 1.
2063 **H. C.**—R. H. LINGWOOD. (Cochin.)
2066 **Com.**—JOHN RIDDELL. (Cochin.)

Langshans.

Class 245.—*Langshan Cocks.* [8 entries, 1 absent.]

2069 **I.** (30*s.*)—JESSE COE, Rock Lodge, Desborough. Apr. 6, 1898.
2075 **II.** (15*s.*)—J. W. WALKER, Upton Lodge, Henley-on-Thames. Jan. 1898.
2074 **III.** (10*s.*)—MAYALL & SIKES, The Laurels, Ludham, Gt. Yarmouth. 1898.
2070 **R. N. & H. C.**—W. COOK & SONS, Orpington House, St. Mary Cray, Kent.
2073 **H. C.**—VINCENT G. HUNTLEY.

Class 246.—*Langshan Hens.* [7 entries, 1 absent.]

2077 **I.** (30*s.*), & 2078 **II.** (15*s.*)—H. C. ARDRON, Syston, Leicester. 1897.
2080 **III.** (10*s.*)—I. W. MORRISS, Andalusian Cottage, Ely.
2079 **R. N.**—VISCOUNT DEERHURST, Birlingham House, Pershore. Apr. 1898.

Class 247.—*Langshan Cockerels.* [8 entries, 1 absent.]

2088 **I.** (30*s.*)—M. G. GOLDSMITH, Blendworth, Horndean, Hants. Jan. 3.
2084 **II.** (15*s.*)—C. I. BARNETT, Mill End, Henley-on-Thames. Jan. 4.
2091 **III.** (10*s.*), & 2090 **R. N. & H. C.**—MAYALL & SIKES, The Laurels, Ludham, Gt. Yarmouth. Jan.
2086 **Com.**—MISS DRYDEN.

Class 248.—*Langshan Pullets.* [9 entries, none absent.]

2096 **I.** (30*s.*)—M. G. GOLDSMITH, Blendworth, Horndean. Jan. 3.
2099 **II.** (15*s.*), & 2098 **III.** (10*s.*)—MAYALL & SIKES, The Laurels, Ludham, Gt. Yarmouth. Jan.
2100 **R. N. & H. C.**—J. W. WALKER, Upton Lodge Henley-on-Thames. Jan. 4.
2097 **H. C.**—COL. P. H. GREIG.

Plymouth Rocks.

Class 249.—*Plymouth Rock Cocks.* [7 entries, 1 absent.]

2104 **I.** (30*s.*)—HENRY PINCHBECK, The Elms, Burton-on-Trent.
2106 **II.** (15*s.*)—F. PORTER, High Street, Bridgwater.
2107 **III.** (10*s.*)—ARTHUR THOMAS, Brownslade, Pembroke.
2101 **R. N. & H. C.**—ABBOT BROS., Thuxton, Norfolk. 1898.
H. C.—G. & S. JACKSON, for No. 2103; H. PINCHBECK, for No. 2105.

Class 250.—*Plymouth Rock Hens.* [8 entries, 1 absent.]

2115 **I.** (30*s.*)—MRS. H. TURNER, Elmdale, Stechford, Birmingham.
2112 **II.** (15*s.*)—FRANK NEAVE, Lingwood, Norwich. 1898.
2114 **III.** (10*s.*)—JOHN PENNINGTON, Sandfield, Heswall-on-Dee. 1897.
2109 **R. N. & H. C.**—JESSE COE, Rock Lodge, Desborough. Apr. 9, 1898.
H. C.—G. & S. JACKSON, for Nos. 2110 & 2111.
2108 **Com.**—ABBOT BROS.

Class 251.—*Plymouth Rock Cockerels.* [14 entries, 2 absent.]

2123 **I.** (30*s.*)—G. & S. JACKSON, The Limes, Silverdale, Lancs.
2117 **II.** (15*s.*)—JESSE COE, Rock Lodge, Desborough. Jan. 17.
2120 **III.** (10*s.*)—J. W. HALL, Thirsk, Yorks. Jan. 20.
2128 **R. N. & H. C.**—MRS. H. TURNER, Elmdale, Stechford, Birmingham. Jan. 21.
H. C.—A. & S. DONKIN, for No. 2119; W. MCCALL, for No. 2124; W. SLATER, for No. 2127.
2125 **Com.**—JOHN PENNINGTON.

Class 252.—*Plymouth Rock Pullets.* [15 entries, 3 absent.]

2138 I. (30*s.*)—H. Cottam Hodgson, Foulshaw, Milnthorpe. Jan. 17.
2143 II. (15*s.*)—W. Slater, Bigland House, Silverdale, Lancs. Jan. 2.
2140 III. (10*s.*)—W. McCall, Gt. Cross, Kirkcudbright, N.B. Jan. 15.
2144 R. N. & H. C.—Mrs. H. Turner, Elmdale, Stechford, Birmingham. Jan. 21.
H. C.—John W. Hall, for No. 2134; H. Cottam Hodgson, for No. 2137; G. & S. Jackson, for No. 2139; Thomas Shepherd, for No. 2142.

Wyandottes.

Class 253.—*Silver Laced Wyandotte Cocks.* [6 entries, none absent.]

2150 I. (30*s.*)—T. Sugden, Ollerton Farm, Withnell, nr. Chorley, Lancs.
2145 II. (15*s.*)—Abbot Bros., Thuxton, Norfolk. 1898.
2146 R. N.—Mrs. Franklin, Syston Old Hall, Grantham. 1898.

Class 254.—*Silver Laced Wyandotte Hens.* [6 entries, none absent.]

2156 I. (30*s.*)—J. G. Morten, Spondon, Derby. 1896.
2151 II. (15*s.*)—Boaden & Thomas, Mawgan, Helston. 1898.
2153 III. (10*s.*)—Mrs. Franklin, Syston Old Hall, Grantham. 1898.
2154 R. N. & H. C.—Tom H. Furness, Saltergate House, Chesterfield.

Class 255.—*Silver Laced Wyandotte Cockerels.* [10 entries, 4 absent.]

2164 I. (30*s.*)—Frank Neave, Lingwood, Norwich. Feb.
2158 II. (15*s.*)—Boaden & Thomas, Mawgan, Helston. Jan. 3.
2160 R. N. & Com.—Mrs. Franklin, Syston Old Hall, Grantham. Feb. 8.

Class 256.—*Silver Laced Wyandotte Pullets.* [7 entries, 2 absent.]

2172 I. (30*s.*)—Frank Neave, Lingwood, Norwich. Feb.
2170 II. (15*s.*)—Tom H. Furness, Saltergate House, Chesterfield.
2167 R. N. & Com.—Abbot Bros., Thuxton, Norfolk. Feb. 10.

Class 257.—*Gold Laced Wyandotte Cocks.* [17 entries, 1 absent.]

2180 I. (30*s.*)—M. G. Goldsmith, Blendworth, Horndean. May, 1897.
2184 II. (15*s.*)—T. Sugden, Ollerton Farm, Withnell, near Chorley.
2183 III. (10*s.*)—Mrs. Pierson, Morley Rectory, Wymondham.
2178 R. N. & H. C.—Charles Butcher, Glasbury, Brecon. 1898.
H. C.—Abbot Bros., for Nos. 2174 & 2175; Mrs. Pierson, for No. 2182; Mrs. Wigan, for No. 2188; W. J. Wightwick, Jun., for No. 2189.
Com.—A. J. Brock, for No. 2177; W. Waterhouse, for No. 2186; Mrs. Wigan, for No. 2187.

Class 258.—*Gold Laced Wyandotte Hens.* [7 entries, 3 absent.]

2191 I. (30*s.*)—Boaden & Thomas, Mawgan, Helston. 1897.
2196 R. N. & H. C.—Mrs. Pierson, Morley Rectory, Wymondham.

Class 259.—*Gold Laced Wyandotte Cockerels.* [9 entries, 1 absent.]

2203 I. (30*s.*)—M. G. Goldsmith, Blendworth, Horndean. Jan. 3.
2202 II. (15*s.*)—Tom H. Furness, Saltergate House, Chesterfield.
2200 III. (10*s.*)—A. J. Brock, 19 St. Peter's St., Canterbury. Jan. 21.
2206 R. N. & H. C.—Mrs. Pierson, Morley Rectory, Wymondham. Jan.
2198 H. C.—John Bee.

Class 260.—*Gold Laced Wyandotte Pullets.*
[10 entries, 1 absent.]

2213 **I.** (30*s.*)—JACKSON BROS., Cringle Brook, Whittingham, Preston. Jan. 6.
2210 **II.** (15*s.*)—CHARLES BUTCHER, Glasbury, Brecon. Jan. 23.
2207 **III.** (10*s.*)—JOHN BEE, Bullsnape Hall, Goosnargh, Preston. Jan. 20.
2216 **R. N. & H. C.**—MRS. ROME, Heath, Chesterfield.

Class 261.—*Wyandotte Cocks or Cockerels, any other variety.*
[13 entries, 3 absent.]

2219 **I.** (30*s.*)—W. COOK & SONS, Orpington House, St. Mary Cray, Kent. (Buff.) Mar. 12, 1898.
2228 **II.** (15*s.*)—J. WHARTON, Honeycott, Hawes, Yorks. (Partridge.)
2218 **III.** (10*s.*)—W. R. BULL, Newport Pagnell. (Buff.) Jan. 10, 1898.
2222 **R. N. & H. C.**—TOM H. FURNESS, Saltergate House, Chesterfield. (White.)
2229 **H. C.**—H. M. WORSFOLD. (Buff.)

Class 262.—*Wyandotte Hens or Pullets, any other variety.*
[11 entries, 2 absent.]

2239 **I.** (30*s.*)—J. WHARTON, Honeycott, Hawes, Yorks. (Partridge.)
2238 **II.** (15*s.*)—MRS. E. SMITH, Gay Hill Farm, King's Norton. (White.) Feb. 1, 1899.
2237 **III.** (10*s.*)—J. G. MORTEN, Spondon, Derby.
2240 **R. N. & H. C.**—H. M. WORSFOLD, Rolls Court, Whitfield, Dover. (Buff.)
2233 **Com.**—MRS. FRANKLIN. (White.)

Orpingtons.

Class 263.—*Orpington Cocks.* [10 entries, none absent.]

2247 **I.** (30*s.*)—JOSEPH PARTINGTON, The Woodlands, Lytham. 1 year.
2248 **II.** (15*s.*)—R. DE C. PEELE, Church House, Ludlow. 1898.
2241 **III.** (10*s.*)—W. COOK & SONS, Orpington House, St. Mary Cray, Kent. Feb. 7, 1898.
2249 **R. N. & H. C.**—H. M. POLLETT, Fernside, Bickley, Kent. 1897.
2242 **H. C.**—W. COOK & SONS. 2245 **Com.**—V. G. HUNTLEY.

Class 264.—*Orpington Hens.* [12 entries, none absent.]

2257 **I.** (30*s.*)—JOSEPH PARTINGTON, The Woodlands, Lytham. 1 year.
2258 **II.** (15*s.*)—R. DE C. PEELE, Church House, Ludlow. 1898.
2251 **III.** (10*s.*)—T. BARRETT, Crossvale, Llanpumpsaint, Carmarthen. Apr. 1, 1898.
2253 **R. N. & H. C.**—W. COOK & SONS, St. Mary Cray. Apr. 3, 1897.
H. C.—W. COOK & SONS, for No. 2252; H. M. POLLETT, for No. 2259.
2262 **Com.**—REV. R. H. WESTHORP.

Class 265.—*Orpington Cockerels.* [15 entries, 1 absent.]

2273 **I.** (30*s.*)—JOSEPH PARTINGTON, The Woodlands, Lytham. 5 months.
2263 **II.** (15*s.*)—T. BARRETT, Crossvale, Llanpumpsaint, Carmarthen. Feb. 1
2271 **III.** (10*s.*)—FRANK NEAVE, Lingwood, Norwich. Feb.
2267 **R. N. & H. C.**—A. J. GOODFELLOW, Welford, Rugby. Jan. 1.
2270 **H. C.**—GEORGE HYDE.
Com.—J. WALLS, for No. 2275; J. WATSON, for No. 2276.

Class 266.—*Orpington Pullets.* [17 entries, 1 absent.]

2289 **I.** (30*s.*)—JOSEPH PARTINGTON, The Woodlands, Lytham. 5 months.
2285 **II.** (15*s.*)—GEORGE HYDE, Silsden, Keighley. Jan. 4.

2293 **III.** (**10***s.*)—J. WALLS, Aston Hall, Sutton Coldfield. Jan. 14.
2278 **R. N. & H. C.**—T. BARRETT, Crossvale, Llanpumpsaint, Carmarthen.
H. C.—H. T. GOODENOUGH, for No. 2281; A. J. GOODFELLOW, for No. 2282; F. NEAVE, for No. 2286; J. WALLS, for No. 2292.

Houdans.

Class 267.—*Houdan Cocks.* [5 entries.]

2299 **I.** (**30***s.*)—S. W. THOMAS, Glasfryn, Forest Fach, Swansea.
2297 **II.** (**15***s.*)—MESDAMES HILL & MACONOCHIE, Tovil House, Maidstone.
2296 **R. N. & H. C.**—J. HILL, Bridgend Mills, Lostwithiel. 1897.
2295 **H. C.**—VISCOUNT DEERHURST.
2298 **Com.**—MESDAMES HILL & MACONOCHIE.

Class 268.—*Houdan Hens.* [5 entries, none absent.]

2303 **I.** (**30***s.*), & 2302 **II.** (**15***s.*)—MESDAMES HILL & MACONOCHIE, Maidstone.
2304 **R. N. & H. C.**—S. W. THOMAS, Glasfryn, Forest Fach, Swansea.
2301 **H. C.**—J. HILL.

Class 269.—*Houdan Cockerels.* [4 entries.]

2306 **I.** (**30***s.*), & 2305 **II.** (**15***s.*)—J. HILL, Bridgend Mills, Lostwithiel. Jan. 12.
2307 **R. N. & H. C.**, & 2308 **H. C.**—MESDAMES HILL & MACONOCHIE.

Class 270.—*Houdan Pullets.* [4 entries.]

2309 **I.** (**30***s.*), & 2310 **II.** (**15***s.*)—J. HILL, Bridgend Mills, Lostwithiel. Jan. 12.
2312 **R. N. & H. C.**, & 2311 **Com.**—MESDAMES HILL & MACONOCHIE.

French (Any Variety, Houdans excepted).

Class 271.—*French Cocks or Cockerels.* [7 entries.]

2315 **I.** (**30***s.*)—S. W. THOMAS, Glasfryn, Forest Fach, Swansea. (Crêve.) Jan. 25, 1899.
2313 **II.** (**15***s.*)—TENNYSON FAWKES, Stroud, Glos. (La Flèche.)
2319 **III.** (**10***s.*)—MRS. ELIZA WILLIAMS, Henllys, Berriew, R.S.O., Mont. (Crêve Cœur.) June 30, 1898.
2314 **R. N. & H. C.**—S. W. THOMAS. (Crêve.) Over 1 year.
2318 **H. C.**—MRS. WILLIAMS. (Crêve Cœur.)
Com.—S. THORNLEY, for Nos. 2316 & 2317 (Salmon Faverolle).

Class 272.—*French Hens or Pullets.* [5 entries.]

2320 **I.** (**30***s.*)—TENNYSON FAWKES, Stroud, Glos. (La Flèche.)
2321 **II.** (**15***s.*), & 2322 **R. N. & H. C.**—S. W. THOMAS, Glasfryn, Forest Fach, Swansea. (Crêve.)
2323 **H.C.** & 2324 **Com.**—S. THORNLEY. (Salmon Faverolle.)

Minorcas.

Class 273.—*Minorca Cocks.* [10 entries, 4 absent.]

2327 **I.** (**30***s.*)—J H. KNOWLES-MORGAN, Carter's Green, West Bromwich.
2325 **II.** (**15***s.*)—J. W. CROSSMAN, The Shrubberies, Galphay, Ripon. 1898.
2330 **III.** (**10***s.*)—H. PINCHBECK, The Elms, Burton-on-Trent.
2334 **R. N. & H. C.**—T. H. WHITEHOUSE, 77 Walsingham Street, Walsall.
2333 **H. C.**—T. C. PLOWMAN.

Class 274.—*Minorca Hens.* [9 entries, 3 absent.]

2338 **I.** (**30**s.)—J. H. KNOWLES-MORGAN, Carter's Green, West Bromwich.
2342 **II.** (**15**s.)—T. C. PLOWMAN, 155 Queen's Road, Finsbury Park, N. Apr. 1898.
2336 **III.** (**10**s.)—J. W. CROSSMAN, The Shrubberies, Galphay, Ripon. 1898.
2343 **R. N. & H. C.**—S. WILSON, Station Rd., Aldridge, Walsall. 1898.
H. C.—F. CAREY, for No. 2335; G. T. KENWORTHY, for No. 2337.

Class 275.—*Minorca Cockerels.* [10 entries, 2 absent.]

2345 **I.** (**30**s.)—J. W. CROSSMAN, The Shrubberies, Galphay, Ripon. Jan. 2.
2351 **II.** (**15**s.)—J. ROBERTS, 13 Strawberry Cottages, Silsden, Keighley. Jan. 5.
2353 **III.** (**10**s.)—WADE BROS., Silsden, Keighley. Jan. 27.
2346 **R. N. & H. C.**—TENNYSON FAWKES, Stroud, Glos. Jan. 17.
2347 **H. C.**—TENNYSON FAWKES. 2352 **Com.**—WM. SNELL.

Class 276.—*Minorca Pullets.* [6 entries, 1 absent.]

2358 **I.** (**30**s.)—R. TOWLER-WILKINSON, Sunnyside, Gargrave, Yorks. Jan. 3.
2356 **II.** (**15**s.)—J. ROBERTS, 13 Strawberry Cottages, Silsden, Keighley. Jan. 5.
2354 **III.** (**10**s.)—J. W. CROSSMAN, The Shrubberies, Galphay, Ripon. Jan. 2.
2359 **R. N. & H. C.**—WADE BROS., Silsden, Keighley, Yorks. Jan. 27.

Leghorns.

Class 277.—*White Leghorn Cocks.* [4 entries, 1 absent.]

2360 **I.** (**30**s.)—MRS. A. C. LISTER-KAY, Burley Manor, Ringwood. Sept. 1898.
2363 **II.** (**15**s.)—WADE BROS., Silsden, Keighley.

Class 278.—*White Leghorn Hens.* [5 entries, none absent.]

2366 **I.** (**30**s.)—MRS. A. C. LISTER-KAY, Burley Manor, Ringwood. 1898.
2368 **II.** (**15**s.)—WADE BROS., Silsden, Keighley.
2364 **R. N. & H. C.**—MISS LUCY CLABBURN, Linden House, Beccles. Apr. 1898.
2367 **Com.**—J. LURCOCK.

Class 279.—*Leghorn Cocks, any other colour.* [3 entries.]

2371 **I.** (**30**s.)—G. H. MARCHANT, Upper Fant Road, Maidstone. May, 1898.
2369 **II.** (**15**s.)—R. H. LINGWOOD, Needham Market. Apr. 10, 1898.
2370 **R. N. & H. C.**—MRS. A. C. LISTER-KAY, Burley Manor, Ringwood. 1898.

Class 280.—*Leghorn Hens, any other colour.* [2 entries.]

2372 **I.** (**30**s.)—W. J. DE SALIS, 40 Booth St., Handsworth, Birmingham.
2373 **II.** (**15**s.)—G. H. MARCHANT, Upper Fant Road, Maidstone.

Class 281.—*Leghorn Cockerels, any colour.* [9 entries, 1 absent.]

2380 **I.** (**30**s.)—WADE BROS., Silsden, Keighley. Jan. 21.
2382 **II.** (**15**s.)—REV. J. H. B. WOLLOCOMBE, Lamerton Vicarage, Tavistock.
2375 **III.** (**10**s.)—WILLIAM GILL, 13 Strawberry Cottages, Silsden, Keighley.
2378 **R. N. & H. C.**—G. H. MARCHANT, Upper Fant Road, Maidstone. Jan. 12.
H. C.—MARTIN COE, for No. 2374; W. HINSON, for No. 2376; R. TOWLER-WILKINSON, for No. 2379.
2381 **Com.**—G. L. WARD.

Class 282.—*Leghorn Pullets, any colour.* [11 entries, none absent.]

2390 **I.** (**30**s.)—R. TOWLER-WILKINSON, Sunnyside, Gargrave, Yorks.
2391 **II.** (**15**s.)—WADE BROS, Silsden, Keighley. Jan. 21.

2393 III. (10*s.*)—THE REV. J. H. B. WOLLOCOMBE, Lamerton Vicarage, Tavistock.
2392 R. N. & H. C.—G. L. WARD, The Bury, Luton, Beds. Jan. 18.
H. C.—WILLIAM GILL, for No. 2385; W. HINSON, for No. 2386; G. & S. JACKSON, for No. 2387.
2383 Com.—W. BIBBY.

Andalusians.

Class 283.—*Andalusian Cocks or Cockerels.* [7 entries, none absent.]

2394 I. (30*s.*)—ABBOT BROS., Thuxton, Norfolk. 1898.
2399 II. (15*s.*), & 2398 III. (10*s.*)—F. PORTER, High Street, Bridgwater.
2396 R. N. & H. C.—W. EVERINGTON, Newton, Swaffham. Jan. 28, 1899.
H. C.—ABBOT BROS., for No. 2395; REV. J. H. B. WOLLOCOMBE, for No. 2400.

Class 284.—*Andalusian Hens or Pullets.* [9 entries, none absent.]

2408 I. (30*s.*), & 2407 III. (10*s.*)—F. PORTER, High Street, Bridgwater.
2403 II. (15*s.*)—W. H. BOURNE, Golden Grove, Hoole, Chester May, 1896.
2401 R. N. & H. C.—ABBOT BROS., Thuxton, Norfolk. 1898.
2405 H. C.—W. EVERINGTON.
Com.—J. PENNINGTON, for No. 2406; G. T. VERNON, for No. 2409.

Hamburghs.

Class 285.—*Hamburgh Cocks or Cockerels, any variety.* [7 entries, none absent.]

2412 I. (30*s.*)—GEORGE DOBLE, Bridgwater. May, 1898.
2416 II. (15*s.*)—WAKEFIELD & ELLIOTT, Swanwick, Alfreton. 1898.
2415 III. (10*s.*)—W. SNELL, 129 High St., Crediton. Mar. 20, 1898.
2413 R. N. & H. C.—JACKSON BROS., Brunthwaite, Silsden. May 16, 1898.
2410 H. C.—REV. S. ASHWELL.

Class 286.—*Hamburgh Hens or Pullets, any variety.* [4 entries, none absent.]

2417 I. (30*s.*)—GEORGE DOBLE, Bridgwater. May, 1898.
2420 II. (15*s.*)—W. SNELL, 129 High Street, Crediton. Apr. 7, 1898.

Any Other Recognised Breeds. (*Bantams excepted.*)

Class 287.—*Cocks.* [5 entries.]

2424 I. (30*s.*)—J. PARTINGTON, The Woodlands, Lytham. (Polish.)
2423 II. (15*s.*)—GEORGE DOBLE, Bridgwater. (Spanish.) Apr. 1898.
2425 R. N. & H. C.—THOMAS TURNER, Halifax Road, Cambridge. (Polish.)
H. C.—VISCOUNT DEERHURST, for No. 2421 (Silkie), & for No. 2422 (Scotch Grey).

Class 288.—*Hens.* [6 entries, 1 absent.]

2430 I. (30*s.*)—J. POWELL, Myrtle Royd, Bingley. (Spanish.)
2429 II. (15*s.*)—J. PARTINGTON, The Woodlands, Lytham. (Polish.)
2431 III. (10*s.*)—C. TURNER, Halifax Road, Cambridge. (Polish.)
2428 R. N. & H. C.—GEORGE DOBLE, Bridgwater. (Spanish.)
2427 H. C.—VISCOUNT DEERHURST. (Silkie.)

Class 289.—*Cockerels.* [2 entries, 1 absent.]

2433 **I.** (**30***s*.)—JOHN FRAYN, St. Stephen's, Launceston. (Malay.)

Class 290.—*Pullets.* [4 entries, 1 absent.]

2437 **I.** (**30***s*.)—J. POWELL, Myrtle Royd, Bingley. (Spanish).
2436 **II.** (**15***s*.)—JOHN FRAYN, St. Stephen's, Launceston. (Malay.)
2434 **R. N. & H. C.**—E. P. CHANCE, Lawnside, Edgbaston. (Ancona.)

DUCKS.

Aylesbury.

Class 291.—*Aylesbury Drakes.* [4 entries, 2 absent.]

2441 **I.** (**30***s*.)—F. READ, Aston Clinton, Tring.
2438 **II.** (**15***s*.)—WM. BYGOTT, Ryehill House, Ulceby. 1898.

Class 292.—*Aylesbury Ducks.* [5 entries, 2 absent.]

2446 **I.** (**30***s*.)—F. READ, Aston Clinton, Tring.
2445 **II.** (**15***s*.)—PERCY PERCIVAL, Somerset Court, Brent Knoll. 2 yrs.
2442 **III.** (**10***s*.)—WM. BYGOTT, Ryehill House, Ulceby. 1898.

Class 293.—*Aylesbury Young Drakes.* [6 entries, 2 absent.]

2452 **I.** (**30***s*.), & 2451 **II.** (**15***s*.)—F. READ, Aston Clinton, Tring. Mar. 10.
2450 **III.** (**10***s*.)—W. POTTER, Weston Turville, Tring. Feb. 23.
2449 **R. N. & H. C.**—PERCY PERCIVAL, Somerset Court, Brent Knoll.

Class 294.—*Aylesbury Ducklings.* [6 entries, 2 absent.]

2457 **I.** (**30***s*.), & 2458 **II.** (**15***s*.)—F. READ, Aston Clinton, Tring. Mar. 15.
2456 **III.** (**10***s*.)—W. POTTER, Weston Turville, Tring. Feb. 23.
2455 **R. N.**—PERCY PERCIVAL, Somerset Court, Brent Knoll.

Rouen.

Class 295.—*Rouen Drakes.* [5 entries.]

2460 **I.** (**30***s*.), & 2461 **R. N. & H. C.**—VINCENT G. HUNTLEY, Trowbridge.
2459 **II.** (**15***s*.)—WM. BYGOTT, Ryehill House, Ulceby. 1897.
2462 **III.** (**10***s*.)—JOSEPH PARTINGTON, The Woodlands, Lytham. 1 year.
2463 **Com.**—A. T. & H. PEARS.

Class 296.—*Rouen Ducks.* [6 entries, 1 absent.]

2467 **I.** (**30***s*.)—VINCENT G. HUNTLEY, Trowbridge.
2464 **II.** (**15***s*.)—WM. BYGOTT, Ryehill House, Ulceby. 1898.
2469 **III.** (**10***s*.)—A. T. & H. PEARS, Mere, Lincoln.

Pekin.

Class 297.—*Pekin Drakes.* [2 entries.]

2471 **I.** (**30***s*.)—PERCY PERCIVAL, Somerset Court, Brent Knoll. $2\frac{1}{2}$ yrs.
2470 **II.** (**15***s*.)—R. T. ALLEN, Crookwood, Potterne, Devizes.

Class 298.—*Pekin Ducks.* [1 entry.]

2472 **II.** (**15***s*.)—R. T. ALLEN, Crookwood, Potterne Devizes.

Cayuga.

Class 299.—*Cayuga Drakes.* [6 entries, none absent.]

2475 I. (30*s.*)—R. S. WILLIAMSON, Cannock Wood House, Hednesford, Staffs. May 1898.
2476 II. (15*s.*)—R. S. WILLIAMSON, Hednesford. June, 1898.
2477 III. (10*s.*)—LADY WILSON, Chillingham Barns, Belford. May, 1897.
2474 R. N. & H. C.—VISCOUNT DEERHURST, Birlingham House, Pershore.

Class 300.—*Cayuga Ducks.* [3 entries.]

2479 I. (30*s.*)—VISCOUNT DEERHURST, Birlingham House, Pershore. Apr. 1898.
2480 II. (15*s.*), & 2481 III. (10*s.*)—LADY WILSON, Chillingham Barns, Belford. May, 1898.

Any Breeds. (*Aylesburys excepted.*)

Class 301.—*Young Drakes.* [6 entries, none absent.]

2483 I. (30*s.*)—WM. BYGOTT, Ryehill House, Ulceby. (Rouen.) Feb. 2.
2485 II. (15*s.*), & 2486 R. N. & H. C.—VISCOUNT DEERHURST, Birlingham House, Pershore. (Cayuga.)
2482 III. (10*s.*)—THE HON. SYBIL M. T. AMHERST, Didlington Hall, Brandon. (Pekin.) Apr. 3.

Class 302.—*Ducklings.* [6 entries.]

2489 I. (30*s.*)—WM. BYGOTT, Ryehill House, Ulceby. (Rouen.) Feb. 2.
2488 II. (15*s.*)—HON. SYBIL M. T. AMHERST, Didlington Hall, Brandon. (Pekin.) Apr. 3.
2492 III. (10*s.*)—VISCOUNT DEERHURST, Birlingham House, Pershore. (Cayuga.) Apr.
2490 R. N. & H. C.—WILLIAM BYGOTT, Ulceby. Mar. 2.
2493 H. C.—VINCENT G. HUNTLEY. 2491 Com.—VISCOUNT DEERHURST.

Geese.

Class 303.—*Embden Ganders.* [5 entries, none absent.]

2494 I. (£2)—ABBOT BROS., Thuxton, Norfolk. 1897.
2496 II. (£1.)—HON. SYBIL M. T. AMHERST, Didlington Hall, Brandon. 1895.
2495 III. (10*s.*)—ABBOT BROS., Thuxton. 1898
2497 R. N.—H. T. GOODENOUGH, Milton Common, Tetsworth.

Class 304.—*Embden Geese.* [4 entries, 1 absent.]

2499 I. (£2), & 2500 II. (£1.)—ABBOT BROS., Thuxton, Norfolk. 1896.
2501 III. (10*s.*)—THE HON. SYBIL M. T. AMHERST, Didlington Hall, Brandon. 1895.

Class 305.—*Toulouse Ganders.* [2 entries.]

2503 I. (£2.)—WM. BYGOTT, Ryehill House, Ulceby. 1897.
2504 II. (£1.)—VINCENT G. HUNTLEY, Trowbridge.

Class 306.—*Toulouse Geese.*
[No entry.]

Turkeys.

Class 307.—*Turkey Cocks.* [9 entries, 5 absent.]

2513 I. (£2.)—LADY WILSON, Chillingham Barns, Belford. (Bronze.) May, 1897.

2505 II. (£1.)—ABBOT BROS., Thuxton, Norfolk. (Mammoth Bronze.) 1897.
2508 III. (10s.)—H. T. GOODENOUGH, Milton Common, Tetsworth. (Mammoth Bronze.) May 7, 1898.
2507 R. N. & H. C.—D. BRICE, JUN., Rushbourne, Sturry, Canterbury. (American Mammoth.) May 5, 1898.

Class 308.—*Turkey Hens.* [7 entries, 2 absent.]

2514 I. (£2.)—ABBOT BROS., Thuxton, Norfolk. (Mammoth Bronze.) 1897.
2519 II. (£1.)—MRS. F. C. SMITH, Oaklands, Boyle, Roscommon. (American Bronze.) May 10, 1897.
2515 III. (10s.)—H. T. GOODENOUGH, Milton Common, Tetsworth. (Mammoth Bronze.) May 6, 1897.
2520 R. N. & H. C.—LADY WILSON, Chillingham Barns, Belford. (Bronze.) May, 1897.

Table Poultry.

Class 309.—*Pairs of Cockerels, of any pure breeds.* [5 entries.]

2525 I. (30s.)—J. R. WADMAN, Bodle St., Hailsham. (Indian Game.) Jan. 20.
2523 II. (15s.)—MESDAMES HILL & MACONOCHIE, Tovil House, Maidstone. (Faverolles.)
2522 III. (10s.)—R. W. CRESWELL-WARD, Neasham Hill, Darlington. (Buff Wyandotte.) Feb. 18.
2521 R. N. & H. C.—WILLIAM BRENT, Clampit, Callington. (Indian Game.)
2124 H. C.—S. THORNLEY. (Salmon Faverolle.)

Class 310.—*Pairs of Pullets, of any pure breeds.* [4 entries, 1 absent.]

2528 I. (30s.)—MESDAMES HILL & MACONOCHIE, Tovil House, Maidstone. (Faverolles.)
2527 II. (15s.)—R. W. CRESSWELL-WARD, Neasham Hill, Darlington. (Buff Wyandotte.) Feb. 18.
2526 R. N. & H. C.—WILLIAM BRENT, Clampit, Callington. (Indian Game.)

Class 311.—*Pairs of Cockerels, of a first cross (Indian Game-Dorking or Dorking-Indian Game).*[1] [4 entries, 1 absent.]

2533 I. (30s.)—F. H. WEBER, Granthams, Chiddingfold, Godalming. Jan. 14.
2532 II. (15s.)—R. H. SUTTON, Redlands, Heathfield, Sussex. Feb.
2530 R. N. & H. C.—H. FRICKER, Wilkins' Farm, Cann, Shaftesbury. Jan. 31.

Class 312.—*Pairs of Pullets, of a first cross (Indian Game-Dorking or Dorking-Indian Game).*[1] [3 entries, none absent.]

2536 I. (30s.)—R. H. SUTTON, Redlands, Heathfield, Sussex. Feb.
2535 R. N.—H. FRICKER, Wilkins' Farm, Cann, Shaftesbury. Jan. 31.

Class 313.—*Pairs of Cockerels, of a first cross (Indian Game-Dorking and Dorking-Indian Game excepted) from any pure breeds.* [2 entries.]

2538 I. (30s.)—J. R. WADMAN, Bodle St., Hailsham. (Indian Game—Sussex.) Feb. 15.
2537 R. N. & H. C.—MESDAMES HILL & MACONOCHIE. (Indian Game—Faverolle.)

---

[1] All the entries in these classes, 311 and 312, were Indian game (Cock)—Dorking (Hen).

Class 314.—*Pairs of Pullets, of a first cross (Indian Game-Dorking and Dorking-Indian Game excepted) from any pure breeds.* [2 entries.]

2540 I. (30s.)—MESDAMES HILL & MACONOCHIE, Tovil House, Maidstone. (Indian Game—Faverolle.)

2539 R. N.—W. HAMBLY, Cutlinwith, St. Germans. (Golden Wyandotte—Dark Dorking.) Jan. 5.

Table Ducklings.

Class 315.—*Pairs of Ducklings, of any pure breeds.* [8 entries, 1 absent.]

2542 I. (30s.)—MESDAMES HILL & MACONOCHIE, Tovil House, Maidstone. (Aylesbury.)

2547 II. (15s.)—F. H. WEBER, Granthams, Chiddingfold, Godalming. (Aylesbury.)

2541 III. (10s.)—VISCOUNT DEERHURST, Birlingham House, Pershore. (Cayuga.)

2544 R. N. & H. C.—W. POTTER, Weston Turville, Tring. (Aylesbury.)

Class 316.—*Pairs of Ducklings, of a first cross from any pure breeds.* [6 entries, 2 absent.]

2552 I. (30s.)—F. READ, Aston Clinton, Tring. (Aylesbury-Pekin.) Apr. 12.

2551 II. (15s.)—W. POTTER, Weston Turville, Tring. (Aylesbury-Pekin.) Apr. 4.

2554 R. N. & H. C.—J. R. WADMAN, Bodle St., Hailsham. (Pekin-Aylesbury.) Feb. 22.

FARM AND DAIRY PRODUCE OF THE UNITED KINGDOM.

Butter.

Class 317.—*Kegs or other Packages of Butter, not less than 14 lb. and under 40 lb. in weight, delivered on or before Saturday, May 6th, 1899.* [7 entries, none absent.]

2558 I. (£10.)—CHARLES HAYES, Keyford House Farm, Frome. (Milk from Cross-bred Cows: Cream raised in shallow pans, churned at 54°, dry salted. Butter made on May 4.)

2559 II. (£5.)—KILLESHANDRA CO-OPERATIVE AGRICULTURAL & DAIRY SOCIETY, LTD., Killeshandra, Co. Cavan. (Milk from cows of Mixed Breeds: Separated cream, churned at 54°, salted under roller on butter worker. Butter made on May 3.)

2560 R. N. & Com.—MISS MABEL G. PRIDEAUX, Motcombe, Shaftesbury. (Milk from cows of Mixed Breeds: Separated cream, pasteurised, churned at 58°, brined in grain, and then drysalted on worker. Butter made on May 4.)

Class 318.—*Boxes of twelve two-pound rolls of Butter, made with not more than 1 per cent. of salt.* [10 entries, 1 absent.]

2570 I. (£5.)—LORD ROTHSCHILD, Tring Park, Herts.

II. (£3.)—*Not Awarded.*

2567 III. (£2.)—R. G. NASH, Tinnistown, Lucan, Co. Dublin.

2566 R. N. & H. C.—LUCAN DAIRY, 24 Parkgate Street, Dublin.

2563 Com.—COAGH CO-OPERATIVE DAIRY SOCIETY, LTD., Coagh, Co. Tyrone.

Class 319.—*Two pounds Fresh Butter, slightly Salted, made up in pounds.* [60 entries, 1 absent.]

2587 (£5.)—Charles Combe, Cobham Park, Surrey.
2612 (£5.)—Mrs. C. McIntosh, Havering Park, Romford.
2629 (£5.)—Mrs. Mary Wigan, Oakwood House, Maidstone.
2631 (£5.)—Miss M. E. Wyles, Bassingfield, Nottingham.
2580 (£3.)—W. J. Burrell, Manor House, Frimley, Farnborough.
2622 (£3.)—Lord Rothschild, Tring Park, Herts.
2627 (£3.)—Miss Urwin, Dunskins, Wolsingham, R.S.O., Co. Durham.
2628 (£3.)—Miss Maria F. Wallator, Haddocks Farm, Bewdley.
2591 (£1.)—Lady de Rothschild, Aston Clinton, Tring, Herts.
2602 (£1.)—The Hon. A. Holland-Hibbert, Munden, Watford.
2607 (£1.)—Charles E. Keyser, Aldermaston Court, Reading.
2619 (£1.)—Lord Poltimore, Poltimore Park, Exeter.
2598 **R. N. & H. C.**—Antony Gibbs, Tyntesfield, Flax Bourton, Som.

H. C.—J. Bates, for No. 2574; Sir James Blyth, Bt., for No. 2576; Countess of Crawford, for No. 2588; Mrs. Knight, for No. 2609.

Com.—S. F. Berry, for No. 2575; W. M. Cazalet, for No. 2582; Dowager Lady Freake, for No. 2594; Mrs. Phillips, for No. 2618.

Class 320.—*Two pounds Fresh Butter, slightly salted, made up in pounds, from Milk drawn from Cows other than Channel Islands, or Cows crossed with Channel Islands Breeds.* [44 entries, none absent.]

2632 (£5.)—J. Baines, West End Farm, Henfield, Sussex.
2641 (£5.)—The Countess of Crawford, Haigh Hall, Wigan.
2646 (£5.)—Antony Gibbs, Tyntesfield, Flax Bourton, Som.
2673 (£5.)—Miss Maria F. Wallator, Haddocks Farm, Bewdley.
2634 (£3.)—S. F. Berry, Old Wellbury, Hitchin.
2636 (£3.)—Mrs. Brown, Manor House, Marske, Richmond, Yorks.
2665 (£3.)—The Earl of Rosebery, K.G., Mentmore, Leighton Buzzard.
2672 (£3.)—Miss Urwin, Dunskins, Wolsingham, R.S.O., Co. Durham.
2633 (£1.)—Mrs. W. C. Basnett, Bank Farm, Oakamoor, Cheadle, Staffs.
2643 (£1.)—T. Danes, Tottington Road Dairy, Aylesford, Kent.
2644 (£1.)—Sir Henry N. Dering, Bt., Surrenden-Dering, Pluckley, Kent.
2663 (£1.)—Miss Mabel G. Prideaux, Motcombe, Shaftesbury.
2662 **R. N. & H. C.**—Lord Poltimore, Poltimore Park, Exeter.

H. C.—J. Carter, for No. 2638; C. Hayes, for No. 2649; Miss Dora H. Pattison, for No. 2660.

Com.—Hon. A. Holland-Hibbert, for No. 2650; Mrs. Phillips, for No. 2661; G. Sears, for No. 2667; Miss E. Thomas, for No. 2669.

Cheese.

Class 321.—*Three Cheddar Cheeses, of not less than* 50 *lb. each, made in* 1899. [16 entries, none absent.]

2691 **I.** (£10.)—Herbert E. Tucker, Steeple Ashton, Trowbridge.
2684 **II.** (£5.)—Joseph Martin, Lottisham, Glastonbury.
2680 **III.** (£3.)—F. W. J. Crocker, Redford Farm, Batcombe, Cattistock.
2678 **R. N. & H. C.**—T. C. Candy, Woolcombe Farm, Cattistock.
2688 **H. C.**—N. J. Sims. 2677 **Com.**—E. L. T. Austen.

Class 322.—*Three Cheshire Cheeses of not less than* 40 *lb. each, made in* 1899. [17 entries, none absent.]

2692 **I.** (£10.)—Thomas Batho, New Marton, Chirk, Ruabon.
2707 **II.** (£5.)—Mrs. Ninis, The Grange, Leighton, Crewe.

2704 III. (£3.)—GEORGE MOSFORD, Tattenhall, Chester.
2697 R. N. & H. C.—RICHARD DUTTON, Old Marton Hall, Ellesmere.
2695 H. C.—BENJAMIN DUTTON.
Com.—WM. DUTTON, for No. 2698; MISS FORSTER, for No. 2699.

Class 323.—*Three Stilton Cheeses, made in* 1899.
[9 entries, none absent.]

2713 I. (£10.)—H. MORRIS, Manor Farm, Saxelby, Melton Mowbray.
2716 II. (£5.)—J. H. WALE, Burton Bandalls, Loughborough.
2711 III. (£3.)—MRS. CHARLOTTE FAIRBROTHER, Beeby, Leicester.
2715 R. N. & H. C.—J. THURMAN, Hartfield Farm, Baggrave, Leicestershire.
2714 Com.—JOHN SMITH.

Class 324.—*Three Wensleydale Cheeses, made in* 1899.
[5 entries, none absent.]

2721 I. (£5.)—METCALF SPENSLEY, Castle Bank, Leyburn, R.S.O.
2722 II. (£3.)—MRS. T. WILLIS, Manor Ho., Carperby, Aysgarth, R.S.O.
2720 III. (£2.)—A. ROWNTREE, Field House, Kirkby Overblow, Leeds.

Class 325.—*Three Cheeses, of any other British make, made in* 1899
[12 entries, none absent.]

2727 I. (£10.)—E. T. GREEN, Steeple Ashton, Trowbridge. (North Wilts Loaf.)
2723 II. (£5.)—E. L. T. AUSTEN, Wolford Fields, Shipston-on-Stour. (Double Gloucester.)
2731 III. (£3.)—N. J. SIMS, Pitcombe Farm, Bruton, Som. (Double Gloucester.)
2724 IV. (£2.)—RICHARD BROWN, Walton Bank, Stone, Staffs. (Leicester.)
2730 R. N. & H. C.—W. J. SELWAY, Manor Farm, West Cranmore, Shepton Mallet. (Somerset Loaf.)
2725 H. C.—F. W. J. CROCKER. (Somerset Thin.)
2728 Com.—J. MARTIN.

Class 326.—*Three Cream Cheeses, made with the use of Rennet.*
[5 entries, none absent.]

2735 I. (£2.)—MRS. F. C. LOXTON, The Creamery, Bath.
2739 II. (£1.)—UNITED CREAMERIES, LTD., Dunragit, Wigtownshire.
2738 R. N.—MISS MABEL G. PRIDEAUX, Motcombe, Shaftesbury.

Class 327.—*Three Cream Cheeses, made without the use of Rennet.*
[10 entries, none absent.]

2745 I. (£2.)—MRS. C. MCINTOSH, Havering Park, Romford.
2744 II. (£1.)—MRS F. C. LOXTON, The Creamery, Bath.
2748 R. N. & Com.—A. ROWNTREE, Field Ho., Kirkby Overblow, Leeds.
2741 Com.—SIR HENRY N. DERING, BT.

CIDER AND PERRY.

Class 328.—*Casks of Cider, not less than* 18, *and not more than* 30, *gallons, made in the Autumn of* 1898. [29 entries, none absent.]

(*The names of the Fruits from which the Cider or Perry was made are added after the address of the Exhibitor. In Classes* 330 *and* 331, *the date of making is also given.*)

2758 I. (£5.)—HENRY HARDEMAN, Swan Hotel, Burford, Tenbury. (White and Red Normans.)

2756 **II.** (£3.)—H. P. Bulmer & Co., Ryelands, Hereford. (Cherry Norman and Kingston Black.)

2763 **III.** (£2.)—James H. Hill, Newtake, Staverton, Totnes. (Nelsons, Kingston Bitters, Barkingdon Bitter Sweet, Machinists, Broad Eyes, Bell Founders, and Striped Blindwells.)

2765 **R. N. & H. C.**—Wm. Mann & Son, Broadhempstone, Totnes. (Mixed Fruit.)

2775 **Com.**—J. C. Waterman & Son. (Mixed Fruit.)

Class 329.—*One Dozen Bottles of Cider, made in the Autumn of* 1898. [30 entries, none absent.]

2791 **I.** (£5.)—Henry Hardeman, Swan Hotel, Burford, Tenbury. (Mixed Fruit.)

2804 **II.** (£3.)—James Slatter & Co., Paxford, Campden, Glos. (Kingston Black.)

2794 **III.** (£2.)—Arthur E. Hill, Egleton Court, Ledbury. (Handsome Norman and Skyrme's Kernel.)

2809 **R. N. & Com.**—W. T. S. Tilley, East Compton, Shepton Mallet. (Doves, Broadnose Pippins, Red Jerseys, and Horners.)

Class 330.—*One Dozen Bottles of Cider, made in any year before* 1898. [21 entries, none absent.]

2829 **I.** (£5.)—Daniel Phelps, Tibberton, Gloucester. (Foxwhelp and Kingston Black, 1895.)
2821 **II.** (£3.)—John Bosley, Lyde, Hereford. (Red Norman, 1897.)
2823 **III.** (£2.)—John Bosley. (Strawberry Norman, 1892.)
2827 **R. N. & H. C.**—Henry Godwin, Holmer Hereford. (Redstreak, 1897.)
2824 **Com.**—H. P. Bulmer & Co. (Foxwhelp and Royal Wilding, 1895.)

Class 331.—*One Dozen Bottles of Perry.* [14 entries, none absent.]

2844 **I.** (£5.)—H. P. Bulmer & Co., Ryelands, Hereford. (Holmer, 1895.)
2843 **II.** (£3.)—H. P. Bulmer & Co. (Longland and Moorcroft, 1898.)
2853 **III.** (£2.)—H. Thomson, Southends, Newent, Glos. (Oldfields, 1898.)
2847 **R. N.**—Arthur E. Hill, Egleton Court, Ledbury. (Oldfields, 1898.)

Hops.

Class 332.—*Pockets of East Kent Hops.*[1] [15 entries, none absent.]

2863 **I.** (£20.)—H. Fitzwalter Plumptre, Goodnestone, Dover.
2858 **II.** (£10.)—G. W. Finn, Westwood Court, Faversham.
2860 **III.** (£5.)—Harry Leney, Selling Court Farm, Selling, Kent.
2855 **R. N. & H. C.**—Fred. Cheesman, Chart Court, Ashford, Kent
2861 **H. C.**—W. Lillywhite. 2868 **Com.**—R. M. Wakeley, Jun.

Class 333.—*Pockets of Mid Kent Hops.*[1] [14 entries, none absent.]

2878 **I.** (£20.)—T. E. Welfear, Burrs Oak Farm, Tonbridge.
2870 **II.** (£10.)—Wm. Chambers, Shepway Court, Maidstone.

[1] Prizes given by the Maidstone Local Committee.

2877 **III.** (£5.)—JAMES PYE, Knights Place, Rochester.
2875 **R. N. & H. C.**—RANDALL MERCER, Sandling Place, Maidstone.
2879 **H. C.**—H. WHITE. 2882 **Com.**—F. WOODHAM.

Class 334.—*Pockets of Weald of Kent Hops.*[1]
[7 entries, 1 absent.]

2884 **I.** (£20.)—THE EARL OF CRANBROOK, G.C.S.I., Hemsted Park, Cranbrook.
2887 **II.** (£10.)—GEORGE NEVE, Sissinghurst, Cranbrook.
2883 **III.** (£5.)—CHARLES CALCUTT, Paynetts, Goudhurst.
2885 **R. N.**—HATCH & ALLEN, The Cage, Tonbridge.

Class 335.—*Pockets of Hants or Surrey Hops.*[1]
[10 entries, none absent.]

2895 **I.** (£20), & 2894 **H. C.**—PERCY & CHARLES SEWARD, Weston, Petersfield.
2892 **II.** (£10), & 2891 **III.** (£5.)—JAMES CHALCRAFT, Aldersnapp, Petersfield.
2890 **R. N. & H. C.**—HENRY CHALCRAFT, Amery Farm, Alton.

Class 336.—*Pockets of Hereford or Worcester Hops.*[1]
[8 entries, none absent.]

2903 **I.** (£20.)—T. L. WALKER, Knightwick Manor, Worcester.
2902 **II.** (£10.)—WM. F. PUDGE, Upper Ho., Bishop's Froome, Worcester.
2901 **III.** (£5.)—H. J. DENT, Perton, Stoke Edith, Hereford.
2900 **R. N. & H. C.**—MRS. BOMFORD, Bush Farm, Callow End, Worcester.
2906 **H. C.**—G. WALLACE. 2904 **Com.**—T. L. WALKER.

Class 337.—*Pockets of Sussex Hops.*[1] [8 entries, none absent.]

2910 **I.** (£20.)—GILBERT EAMES, Linch, Midhurst.
2914 **II.** (£10.)—ALBERT ROBERTS, Beckley.
2909 **III.** (£5.)—R. H. BURGESS, Salehurst Park, Robertsbridge.
2912 **R. N. & H. C.**—W. W. LEADAM, M.D., Stonehurst, Mayfield.
2908 **Com.**—W. ARNOLD & SONS.

Preserved Fruits and Vegetables.

Class 338.—*Collections of Dried or Evaporated Fruits.*[1]
[No entry.]

Class 339.—*Collections of Dried or Evaporated Vegetables.*[1]
[No entry.]

Class 340.—*Collections of Bottled Fruits (Whole Fruits), to be shown in Clear Glass Bottles.*[1] [4 entries, none absent.]

2918 **I.** (£5.)—OWEN ROBERTS, Willington Lodge, Tarporley.
2919 **II.** (£3.)—AMOS WALKER, Road Side, Christleton, Chester.
2917 **R. N. & H. C.**—GEORGE FOWLER, 19, Knightrider Street, Maidstone.

Class 341.—*Collections of Preserved Fruits for Dessert Purposes, in Boxes or other suitable Receptacles.*[1]
[No entry.]

[1] Prizes given by the Maidstone Local Committee.

Class 342.—*Collections of Jams, to be shown in 1 lb. Clear Glass Jars.*[1] [2 entries.]

2920 **I.** (£5.)—MRS. BARNEY, 25 Gladstone Road, Maidstone.
2921 **R. N.**—MRS. FOWLER, 19 Knightrider Street, Maidstone.

HIVES, HONEY, AND BEE APPLIANCES.[2]

Appliances.

Class 343.—*Collections of Hives and Appliances.* [8 entries, none absent.]

2925 **I.** (£4.)—J. LEE & SON, 5 Holborn Place, London, W.C.
2926 **II.** (£2 10*s.*)—W. P. MEADOWS, Syston, Leicester.
2922 **III.** (£1 10*s.*)—R. H. COLTMAN, 49 Station Street, Burton-on-Trent.
2923 **R. N. & H. C.**—J. S. GREENHILL, 80 Graham Road, Wimbledon.
2928 **H. C.**—F. SLADEN. 2929 **Com.**—G. H. VARTY.

Class 344.—*Outfits for Beginners in Bee-keeping.* [7 entries, none absent.]

2934 **I.** (30*s.*)—W. P. MEADOWS, Syston, Leicester.
2933 **II.** (20*s.*)—T. LANAWAY & SONS, Warwick Hive Works, Redhill.
2930 **III.** (15*s.*)—R. H. COLTMAN, 49 Station Street, Burton-on-Trent.
2936 **R. N. & H. C.**—G. H. VARTY, Etwall, Derby.

Class 345.—*Observatory Hives of not less than two Frames with Bees and Queen.* [6 entries, 1 absent.]

2939 **I.** (30*s.*)—JAS. LEE & SON, 5 Holborn Place, London, W.C.
2942 **II.** (20*s.*)—T. RICHARDS, Wood Street, Church Gresley, Burton-on-Trent.
2941 **III.** (10*s.*)—C. T. OVERTON, Lowfield Apiary, Crawley.
2937 **R. N.**—JAMES EARL, Broadfield, Crawley.

Class 346.—*Observatory Hives, single Frame, with Bees and Queen.* [6 entries, 1 absent.]

2948 **I.** (30*s.*)—T. RICHARDS, Wood Street, Church Gresley, Burton-on-Trent.
2947 **II.** (20*s.*)—J. PLAYFORD, The Apiary, Staplehurst, Kent.
2945 **III.** (10*s.*)—THE HORTICULTURAL COLLEGE, Swanley, Kent.
2944 **R. N.**—MISS S. J. COOPER, St. Nicholas Square, Leicester.

Class 347.—*Frame Hives for general use, unpainted.* [10 entries, none absent.]

2953 **I.** (20*s.*)—JAS. LEE & SON, 5 Holborn Place, London, W.C.
2956 **II.** (15*s.*)—F. SLADEN, Ripple Court Apiary, near Dover.
2955 **III.** (10*s.*)—C. T. OVERTON, Lowfield Apiary, Crawley.
2949 **R. N. & Com.**—R. H. COLTMAN, 49 Station Street, Burton-on-Trent.
2952 **Com.**—T. LANAWAY & SONS.

Class 348.—*Frame Hives for Cottagers' use, unpainted.* [8 entries, none absent.]

2959 **I.** (20*s.*)—R. H. COLTMAN, 49 Station Street, Burton-on-Trent.
2963 **II.** (15*s.*)—W. P. MEADOWS, Syston, Leicester.

---

[1] Prizes given by the Maidstone Local Committee.
[2] Prizes given by the British Bee-keepers' Association.

2960 **III.** (10*s.*)—J. S. GREENHILL, 80 Graham Road, Wimbledon.
2962 **R. N. & H. C.**—T. LANAWAY & SONS, Warwick Hive Works, Redhill.
2964 **H. C.**—W. P. MEADOWS.
Com.—*G. H.* VARTY, *for Nos.* 2966 & 2967.

Class 349.—*Honey Extractors.*[1] [5 entries, none absent.]

2970 **I.** (15*s.*), 2971 **II.** (10*s.*), & 2972 **R. N. & H. C.**—W. P. MEADOWS, Syston, Leicester.

Class 350.—*Useful appliances connected with Bee-keeping, introduced since* 1897. [14 entries, 1 absent.]

[No Award.]

Honey.

Class 351.—*Twelve Sections of Comb Honey, gathered in* 1899. [36 entries, 24 absent.]

3006 **I.** (20*s.*)—MISS M. L. GAYTON, Much Hadham, Herts.
3017 **II.** (15*s.*)—E. E. SMITH, Church Street, Southfleet, Gravesend.
3004 **III.** (10*s.*)—GEORGE FAIRS, Mundham, Chichester.
2992 **IV.** (5*s.*)—R. BROWN, Flora Apiary, Somersham, Hunts.
3016 **R. N.**—H. W. SEYMOUR, 53 Market Place, Henley-on-Thames.

Class 352.—*Twelve Sections of Comb Honey, gathered before or in* 1898. [9 entries, 1 absent.]

3027 **I.** (20*s.*)—MRS. LONGHURST, Longfield, Kent.
3028 **II.** (15*s.*)—W. P. MEADOWS, Syston, Leicester.
3029 **III.** (10*s.*)—J. SOPP, Crowmarsh, Wallingford.
3025 **IV.** (5*s.*)—GENERAL STANLEY EDWARDES, The Croft, Farningham.
3026 **R. N.**—PHIL JONES, Chelmick Valley, Church Stretton.

Class 353.—*Twelve Sections of Comb Heather Honey, of any year.* [8 entries, 1 absent.]

3037 **I** (20*s.*)—R. W. PATTEN, Rock, Alnwick.
3038 **II.** (15*s.*), & 3039 **III.** (10*s.*)—THOMAS WALKER, Esthwaite, Hawkshead, Lancs.
3033 **IV.** (5*s.*), & 3034 **R. N.**—ROBERT HUGGUP, Low Hedgeley, Glanton, R.S.O.

Class 354.—*Three Shallow Frames of Comb Honey, for Extracting, gathered in* 1899. [22 entries, 15 absent.]

3058 **I.** (20*s.*), 3059 **II.** (15*s.*), 3057 **IV.** (5*s.*), & 3060 **R. N.**—GEORGE WELLS, Eccles, Aylesford, Kent.
3041 **III.** (10*s.*)—R. BROWN, Flora Apiary, Somersham, Hunts.

Class 355.—*Twelve Jars of Run or Extracted Light-coloured Honey, gathered in* 1899. [33 entries, 17 absent.]

3071 **I.** (20*s.*)—F. CHAPMAN, The Dairy, Wells, Somerset.
3093 **II.** (15*s.*)—E. C. R. WHITE, Holbury Mill, near Romsey.
3083 **III.** (10*s.*)—MRS. LONGHURST, Longfield, Kent.
3067 **IV.** (5*s.*)—R. BROWN, Flora Apiary, Somersham, Hunts.
3072 **R. N. & Com.**—MISS S. J. COOPER, St. Nicholas Square, Leicester.

[1] Prizes given by Mr. T. W. Cowan.

Class 356.—*Twelve Jars of Run or Extracted Dark-coloured Honey (other than Heather), gathered in* 1899. [13 entries, 5 absent.]

3095 **I.** (**20***s.*)—John Berry, The Apiary, Llanrwst, N. Wales.
3106 **II.** (**15***s.*)—Mrs. Woosnam, Rora, Bickington, Newton Abbot.
3102 **III.** (**10***s.*)—E. E. Smith, Church Street, Southfleet, Gravesend.
3099 **IV.** (**5***s.*)—Miss M. L. Gayton, Much Hadham, Herts.
3107 **R. N.**—J. H. Wootton, Byford, Hereford.

Class 357.—*Twelve Jars of Run or Extracted Honey, gathered before or in* 1898. [13 entries, none absent.]

3110 **I.** (**20***s.*)—Lieut. Hawker, Longparish, Hants.
3118 **II.** (**15***s.*)—H. W. Seymour, 53 Market Place, Henley-on Thames.
3119 **III.** (**10***s.*)—J. Sopp, Crowmarsh, Wallingford, Berks.
3112 **IV.** (**5***s.*)—Mrs. Longhurst, Longfield, Kent.
3116 **R. N.**—Hugh Rhys, Redbrook, Monmouthshire.

Class 358.—*Twelve Jars of Run or Extracted Heather Honey, gathered in* 1898. [9 entries, 1 absent.]

3121 **I.** (**20***s.*)—John Berry, The Apiary, Llanrwst, N. Wales.
3123 **II.** (**15***s.*)—W. Drinkall, Balfern Terrace, Clitheroe.
3129 **III.** (**10***s.*)—W. Sproston, Shugborough, Great Haywood, Staffs.
3128 **IV.** (**5***s.*)—T. Richards, Wood Street, Church Gresley, Burton-on-Trent.
3127 **R. N.**—E. Middlemass, Stamford, Alnwick.

Class 359.—*Twelve Jars of Granulated Honey, gathered before or in* 1898. [18 entries, 3 absent.]

3135 **I.** (**20***s.*)—Francis Harper, Spiceal Street, Uttoxeter.
3145 **II.** (**15***s.*)—H. W. Seymour, 53 Market Place, Henley-on-Thames.
3139 **III.** (**10***s.*)—Mrs. Longhurst, Longfield, Kent.
3131 **IV.** (**5***s.*)—R. Brown, Flora Apiary, Somersham, Hunts.
3130 **R. N.**—John Berry, The Apiary, Llanrwst, N. Wales.

Class 360.—*Best and most attractive Displays of Honey in any form, and of any year.* [6 entries, 2 absent.]

3153 **I.** (**40***s.*)—H. W. Seymour, 53 Market Place, Henley-on-Thames.
3150 **II.** (**30***s.*)—Mrs. Longhurst, Longfield, Kent.
3151 **III.** (**20***s.*)—W. P. Meadows, Syston, Leicester.
3149 **IV.** (**10***s.*)—Jas. Lee & Son, 5 Holborn Place, London, W.C.

Miscellaneous.

Class 361.—*Exhibits of not less than 3 lb. of Wax, produced by the Exhibitor's own Bees.* [13 entries, 4 absent.]

3155 **I.** (**15***s.*), & 3154 **II.** (**10***s.*)—John Berry, The Apiary, Llanrwst, N. Wales.
3160 **III.** (**7***s.* **6***d.*)—Mrs. Longhurst, Longfield, Kent.
3163 **IV.** (**5***s.*)—C. S. Wadey, 1 Pine View, Broadstone, Dorset.
3161 **R. N.**—H. W. Seymour, 53 Market Place, Henley-on-Thames.

Class 362.—*Exhibits of not less than 3 lb. of Wax, the produce of the Exhibitor's Apiary, extracted and cleaned by the Exhibitor or his Assistants.* [7 entries, 1 absent.]

3171 **I.** (**15***s.*)—H. W. Seymour, 53 Market Place, Henley-on-Thames.
3170 **II.** (**10***s.*)—Mrs. Longhurst, Longfield, Kent.
3167 **III.** (**7***s.* **6***d.*)—John Berry, The Apiary, Llanrwst, N. Wales.
3168 **IV.** (**5***s.*)—J. Edwards, Callington, Cornwall.

Class 363.—*Half-gallon of Honey Vinegar.* [2 entries.]

3174 I. (7*s.* 6*d.*)—MRS. LONGHURST, Longfield, Kent.
3175 R. N.—H. W. SEYMOUR, 53 Market Place, Henley-on-Thames.

Class 364.—*Half-gallon of Mead.* [2 entries.]

3177 I. (7*s.* 6*d.*)—H. W. SEYMOUR, 53 Market Place, Henley-on-Thames.
3176 R. N. & H. C.—MRS. LONGHURST, Longfield, Kent.

Class 365.—*Interesting and instructive Exhibits of a Practical Nature connected with Bee-culture, not mentioned in the foregoing Classes.* [1 entry.]

3178 I. (£1.)—H. W. SEYMOUR, 53 Market Place, Henley-on-Thames.

Class 366.—*Interesting and Instructive Exhibits of a Scientific Nature, not mentioned in the foregoing Classes.* [1 entry.]

3179 I. (£1.)—F. SLADEN, Ripple Court Apiary, near Dover.

IMPLEMENTS.

Class I.—Machines for washing Hops, *with Liquid Insecticides, to be worked by Horse Power or Mechanical Power.* [7 entries, none absent.]

1262 I. (£50.)—DRAKE & FLETCHER, Maidstone, for the "Mistifier," Class ACS.

Cream Separators.

Class II.—*Power Machines suitable for Farm Use.* [6 entries, none absent.]

3922 I. (£20.)—DAIRY SUPPLY CO., LTD., Museum St., W.C., for "The Farmer's Surprise," No. 3 Steam Turbine.
II. (£10.)—*Not Awarded.*

Class III.—*Hand Power Machines, the Power taken to drive the same not to exceed* 2,500 *foot-lbs.* [9 entries, none absent.]

3924 I. (£20.)—DAIRY SUPPLY CO., LTD., for "The Farmer's Surprise," No. 1.
2893 II. (£10.)—MELOTTE SEPARATOR SALES CO., Counterslip, Bristol, for the "Melotte," No. 2.

Class IV.—Machines for the Evaporation of Fruit and Vegetables.[1]

[No entry.]

Packages for the Carriage of Fruit.

Class V.—*Packages for the Carriage of Soft Fruit.*[1] [3 entries.]
[No merit.]

Class VI.—*Packages for the Carriage of Hard Fruit.*[1]
[3 entries.] [No entries suitable for commercial purposes.]

[1] Prizes offered by the Maidstone Local Committee.

Silver Medals.

For Articles entered as "New Implements for Agricultural or Estate purposes.

4164 THE "BARTON-GILLETTE" HORSE CLIPPING AND SHEEP SHEARING Co., LIMITED, for Improvements in Pedal Power Sheep Shearing Machine, comprising Counterbalances and Ball Bearings in Shears.

4170 ALFRED HETHERINGTON & Co., for Roller Floor for Hop Kiln.

2894 MELOTTE SEPARATOR SALES Co., for the arrangement for driving the bowl by means of a Suspended Spindle running on Balls.

3924A DAIRY SUPPLY Co., LIMITED, for the arrangement of a centre tube in the bowl of a Separator fitted with the Alpha Patent Discs in such a manner that the incoming milk is delivered along the whole depth of the bowl.

HORSE-SHOEING COMPETITIONS.

(*Open to the United Kingdom.*)

Class 1.—*Light Horses.* [24 entries, 2 absent.]

2 **I.** (£5.)—W. J. BRADLEY,[1] R.S.S., Kelstedge, Ashover, Chesterfield.
19 **II.** (£4.)—W. H. STANBURY, R.S.S., 5 Clarence Pl., Stonehouse, Plymouth.
20 **III.** (£3.)—WILLIAM STANTON, R.S.S., Castle Street, Luton.
13 **IV.** (£2.)—J. E. MILNER, R.S.S., 31 Buck Street, Bradford.
7 **V.** (£1.)—JAMES FRAYN, R.S.S., 2 Druckham Cottages, Launceston.
21 **VI.** (£1.)—ROBERT VIGAR, R.S.S., High Street, Caterham, Surrey.
10 **R. N. & H. C.**—THOMAS KERR, R.S.S., Whitchurch Hill, near Reading.
12 **H. C.**—W. D. LANE, R.S.S., Llanvetherine, near Abergavenny.
16 **H. C.**—W. SCHOLEY, R.S.S., Worsborough Dale, near Barnsley.
22 **H. C.**—PHILIP WILLIAMS, R.S.S., 20 Morgan Street, Havod, Pontypridd.

Class 2.—*Heavy Horses.* [31 entries, 3 absent.]

38 **I.** (£5.)—GEORGE JONES,* R.S.S., The Hendre, Monmouth.
42 **II.** (£4.)—FREDERICK MAY, R.S.S., Oaks Road, Woking.
50 **III.** (£3.)—JOSEPH SHIPSTONE, JUN., R.S.S., 14 Lime St., Bulwell, Notts.
29 **IV.** (£2.)—DANIEL CRAWLEY, R.S.S., 1 Mount Pleasant, Caterham Valley.
54 **V.** (£1.)—SAMUEL THOMPSON, R.S.S., Castle Street, Luton.
44 **VI.** (£1.)—ALFRED PARTRIDGE, R.S.S., 233 Old Ford Road, Bow, E.
34 **R. N. & H. C.**—HARRY GREENBANK, R.S.S., The Forge, Whitton, Hounslow.
43 **H. C.**—JAMES MAY, R.S.S., 7 Upperton Road, Guildford.
55 **H. C.**—H. WHITEHEAD, R.S.S., Crofton, Wakefield.
33 **Com.**—G. L. GOLDSMITH, R.S.S., 6 Garfield Place, Faversham.
41 **Com.**—R. LEWIS, R.S.S., 20 Alfred Rd., Harrow Rd., London, W.
45 **Com.**—GEORGE PEPPER, R.S.S., Bilborough, Notts.
53 **Com.**—LEWIS J. SPARROW, R.S.S., Gt. Baddow, Chelmsford.

---

[1] Recommended by the Judges for the FREEDOM OF THE WORSHIPFUL COMPANY OF FARRIERS.

LIST OF CHAMPION PRIZES

AWARDED AT THE MAIDSTONE MEETING, 1899.

HORSES.

R. E. DIXON : Hunters' Improvement Society's **Gold Medal** for the best HUNTER Filly, **Lady Meta** (Class 11, No. 49).

HARRY LIVESEY : Hackney Horse Society's **Gold Medal** for the best HACKNEY Stallion, **McKinley** (Class 16, No. 75).

HARRY LIVESEY : Hackney Horse Society's **Gold Medal** for the best HACKNEY Mare or Filly, **Orange Blossom** (Class 19, No. 95).

SIR WALTER GILBEY, BT. : Polo Pony Society's **Gold Medal** for the best POLO PONY Stallion, **Rosewater** (Class 32, No. 179).

JOHN BARKER : Polo Pony Society's **Gold Medal** for the best POLO PONY Mare, **Lightning** (Class 35, No. 189).

ALEXANDER HENDERSON, M.P. : Shire Horse Society's **Gold Medal** for the best SHIRE Stallion, **Buscot Harold** (Class 43, No. 260).

CAPTAIN W. H. O. DUNCOMBE : Shire Horse Society's **Gold Medal** for the best SHIRE Mare or Filly, **Boro' Royal** (Class 47, No. 308).

CATTLE.

J. DEANE WILLIS : Shorthorn Society's **Prize of £20** for the best SHORTHORN Bull, **Bapton Emperor** (Class 67, No. 489).

HER MAJESTY THE QUEEN : Shorthorn Society's **Prize of £20** for the best SHORTHORN Cow or Heifer, **Cicely** (Class 71, No. 528).

THE EARL OF DERBY : Sussex Herd Book Society's **Prize of £10** for the best SUSSEX Animal, **Bangle** (Class 90, No. 691).

R. HARVEY MASON : Red Polled Society's **Prize of £10** for the best RED POLLED Bull, **Magician** (Class 99, No. 742).

JAMES E. PLATT : Red Polled Society's **Prize of £10** for the best RED POLLED Cow or Heifer, **Delphine** (Class 101, No. 757).

REV. CHARLES BOLDEN : Polled Cattle Society's **Gold Medal** for the best ABERDEEN ANGUS Animal, **Proud Duke of Ballindalloch** (Class 104, No. 773).

ROBERTSON & SONS : Kerry and Dexter Cattle Society's **Prize of £21** for the best KERRY Animal, **La Mancha Merry Boy** (Class 129, No. 1061).

H.R.H. THE PRINCE OF WALES, K.G. : Kerry and Dexter Cattle Society's Cup for the best DEXTER Animal, **Baha** (Class 132, No. 1076).

SHEEP.

S. E. DEAN & SONS : Lincoln Long Wool Sheep Breeders' Association's **Prize of £10 10s.** for the best LINCOLN Ram, **Laughton 235 Guineas** (Class 146, No. 1162).

THE DUKE OF RICHMOND AND GORDON, K.G. : Southdown Sheep Society's **Prize of £10 10s.** for the best SOUTHDOWN Ram (Class 162, No. 1370).

THE EARL OF ELLESMERE : Suffolk Sheep Society's **Gold Medal** for the best SUFFOLK Ram (Class 174, No. 1541).

WILLIAM MILLEN : Maidstone Local Committee's **Prize of £15** for the best KENTISH Ram, **Darlington 64th** (Class 181, No. 1609).

HENRY RIGDEN : Maidstone Local Committee's **Prize of £15** for the best Pen of Three KENTISH Ewes (Class 184, No. 1661).

PIGS.

SIR GILBERT GREENALL, BT. : National Pig Breeders' Association's **Gold Medal** for the best LARGE WHITE Boar or Sow, **Walton Eclipse II.** (Class 201, No. 1742).

SIR GILBERT GREENALL, BT. : National Pig Breeders' Association's **Gold Medal** for the best MIDDLE WHITE Boar or Sow, **Walton Mayflower IV.** (Class 207, No. 1794).

THE HON. D. P. BOUVERIE : National Pig Breeders' Association's **Gold Medal** for the best SMALL WHITE Boar or Sow, **Coleshill Emperor II.** (Class 209, No. 1804).

J. JEFFERSON : British Berkshire Society's **Prize of £5** for the best BERKSHIRE Boar or Sow, **Peel Jessie** (Class 215, No. 1850).

D. W. PHILIP : National Pig Breeders' Association's **Gold Medal** for the best TAMWORTH Boar or Sow, **Whitacre Beauty** (Class 219, No. 1880).

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Proceedings of the Council.

WEDNESDAY, NOVEMBER 1, 1899.

H.R.H. THE PRINCE OF WALES, K.G. (PRESIDENT), IN THE CHAIR.

Present:

Trustees.—Earl Egerton of Tatton, Sir Walter Gilbey, Bart., Colonel Sir Nigel Kingscote, K.C.B., Earl Spencer, K.G., Sir John Thorold, Bart.

Vice-Presidents.—H.R.H. Prince Christian, K.G., Earl Cawdor, Mr. H. Chandos-Pole-Gell, the Earl of Coventry, the Earl of Feversham, Lord Moreton, Sir Jacob Wilson.

Other Members of Council.—Mr. J. H. Arkwright, Mr. Alfred Ashworth, Mr. R. C. Assheton, Viscount Baring, Mr. George Blake, Mr. J. Bowen-Jones, Lord Brougham and Vaux, Lord Arthur Cecil, Mr. F. S. W. Cornwallis, M.P., Mr. Percy Crutchley, Lieut.-Colonel Curtis-Hayward, Mr. J. Marshall Dugdale, Mr. W. Frankish, Mr. Hugh Gorringe, Mr. R. Neville Grenville, Mr. James Hornsby, the Earl of Jersey, G.C.M.G., Captain W. S. B. Levett, Mr. C. S. Mainwaring, Mr. Joseph Martin, Mr. T. H. Miller, the Hon. Cecil T. Parker, Mr. Dan. Pidgeon, Mr. J. E. Ransome, Mr. Frederick Reynard, Mr. C. C. Rogers, Mr. Howard P. Ryland, Mr. G. H. Sanday, Mr. Alfred J. Smith, Mr. E. W. Stanyforth, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. J. P. Terry, Mr. R. A. Warren, Mr. E. V. V. Wheeler, Mr. J. C. Williams.

Officers.—Sir Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. J. E. Compton-Bracebridge, Assistant Director; Mr. R. S. Burgess, Superintendent of the Showyard.

Professor Sir George Brown, C.B., Professor McFadyean.

The following members of the York Local Committee were also present:—The Lord Mayor of York (Mr. Alderman Border), the Sheriff of York (Mr. J. J. Hunt), Mr. Alderman J. S. Rymer, Mr. Francis E. Walker, and Mr. G. A. Eason Wilkinson.

Apologies for non-attendance were received from Mr. Victor C. W. Cavendish, M.P., Mr. A. E. W. Darby, Mr. Henry D. Marshall, Mr. A. E. Pease, M.P., Mr. Albert Pell, Mr. S. Rowlandson, Mr. Henry Smith, and Mr. Charles Whitehead.

Election of New Members.

The Minutes of the last Ordinary Meeting of the Council, held on July 26th, 1899, having been taken as read and approved, the election of the following thirty members was proceeded with:—

ARNOTT, G. W. Campbell..27 William Street, New York.
BARNETT, Walter..Bilton Hall, Rugby.
BASSET, A. F...Tehidy, Camborne, Cornwall.
BEACH, M. H. Hicks..Coln St. Aldwyns, Fairford.
BORLAND, John K...Hermitage, Fordoun, N.B.
CHRISTY, William M...Watergate, Emsworth, Hants.
CLOETE, Henry, C.M.G...Alphen, Wynberg, Cape of Good Hope.
DALE, James..Green End, Broughton Hall, Chester.
FENWICK, H. G...Birtley, Chester-le-Street.
HAVELOCK-ALLAN, Sir Henry S. M., Bart... Blackwell Grange, Darlington.
HUNT, Sidney W...Station Road, Harrow.

INGRAM, F. W...Higham Court, Woodford Green.
JOHNSTONE, J. Campbell..Whyly, East Hoathly, Sussex.
KING, Humphrey..High Street, Tewkesbury.
MELOTTE, Jules..Remicourt, Belgium.
MILDMAY, G. St. John..Taplins, Winchfield.
MILN, George P...Milnholme, Chester.
MITCHELL, R. A. H...Eton College, Windsor.
PRENTICE, W. Henry..Stowmarket.
RAWBONE, James..Broadlands, Sir Lowry Pass, Cape Colony.
ROBERTS, Malcolm, R.A...Glassenbury, Cranbrook, Kent.
ROBINSON, Arthur M...Thrum Hall, Rochdale.
ROBINSON, Charles J...Falinge Lawn, Rochdale.
ROBINSON, Miss E. J...Quedgeley House, near Gloucester.
RODDAM, J. W...Newtown, Stanhope, R.S.O., Durham.
SCOTT, F. W. A...Rydale, Weybridge.
*SHERSTON, T. P. D...Tyddynlan, Corwen, Merioneth.
SMYTHE, Captain E. W...Acton Burnell Park, Shrewsbury.
TREHANE, James..Sacombe Bury, near Ware.
YOUNG, Charles F...The Moat, Melbourn, Cambs.

* Reinstated under Bye-Law 12.

The Reports of the various Standing Committees were then presented, and adopted, as below:—

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the three months ended October 28, as certified by the Society's accountants, showed total receipts amounting to 16,332*l.* 19*s.* 1*d.*, and expenditure 13,748*l.* 12*s.* 11*d.* Accounts amounting in all to 1,956*l.* 2*s.* 9*d.* had been passed and were recommended for payment. The quarterly statement of subscriptions, arrears, and property, to September 30, 1899, had been laid upon the table. The draft Balance-Sheet for the Maidstone Meeting had been submitted by the Secretary and ordered to be laid before the Auditors for their approval. The Committee regretted to have to report that the net loss to the Society on the Maidstone Meeting was 6,382*l.*

Financial Results of the Maidstone Meeting.

Sir NIGEL KINGSCOTE, in presenting this report, said he thought the Council would wish to know at once what was the general outcome of the Maidstone Show—which, he was sorry to say, was a loss to the Society of 6,382*l.*

The chief item of expenditure connected with the show was, of course, the erection of the sheds and buildings and preparation of the site for the purposes of a showyard. This cost the Society at Maidstone 8,182*l.* There was, as the Council would understand, a very large indispensable expenditure which had annually to be incurred by the Society under this head, whether the show were large or small; but, of course, the cost of the building of the Maidstone showyard was less than that of the two large shows at Manchester and Birmingham in 1897 and 1898. Timber was now dearer than it used to be, and the price of labour was going up. Moreover, the Society was now under the necessity of laying water-pipes throughout the showyard, which was formerly undertaken and paid for by the Local Committee.

The Society had to employ a skilled clerical staff at Hanover Square throughout the year to conduct the correspondence relating to the Show, to deal with the entries, prepare the catalogue, and transact other administrative business connected with the show; and this staff had to be largely augmented at the time of the Show by stewards, assistant stewards, money-takers, ticket-sellers, foremen, grooms, yardmen, door- and gate-keepers, dairy assistants, veterinary surgeons, engineers, and police (which last item alone accounted at Maidstone for 602*l.*). The total expense for staff and administration was this year 4,327*l.* The Society disbursed 4,791*l.* in prizes, 674*l.* for forage for the animals, 961*l.* for the expenses of the judges, 1,175*l.* for printing (including catalogues), 709*l.* for advertisements, and 313*l.* for band, ambulance, implement trials, and miscellaneous expenses.

These were large figures, yet they took no account of the expenditure of the Maidstone Local Committee, amounting to no less than 8,200*l.* in providing and preparing the site, supply of water, local prizes, expenses, and the like. The Society having once pledged itself to the holding of the

show, had practically to expend, or make itself responsible for, the whole of the items above referred to, amounting in all to 21,132*l.*, before it opened the doors of the show to the public. It had received towards this expenditure, 2,000*l.* from the Local Committee, 4,506*l.* for fees from the implement exhibitors, 1,648*l.* from entries of live stock, 240*l.* from other entries, and 216*l.* from various sources. These items only amounted to 8,610*l.*, and for the balance (12,522*l.*) of its total expenditure, the Society had nothing but the admissions of the paying public to look to. Only 68,576 persons, however, passed the gates (the lowest for twenty-five years), and as these visitors only paid—including purchases of catalogues—6,140*l.*, there was a debit balance of 6,382*l.* which had to fall on the Society's general funds.

As the average takings of the previous six years had been 12,100*l.*, this was, of course, a very serious disappointment, both to the Society and to the Maidstone Local Commitee, who had worked so hard and had raised so considerable a fund in the county of Kent for the local expenses of the show. But for the kindness of several friends and well-wishers of the Society, who had been so good as to take up some of the Society's holding of Harewood House Debenture Stock, the amount of the Society's liquid assets in the shape of Consols would have been very dangerously depleted.

As he had said at the last Council meeting on July 26, it might be frankly admitted that Maidstone was hardly the place at which the Society, had it been actuated only by monetary considerations, would have pitched its showyard during the present year. But it was in accordance with the present scheme of rotation of districts that there should be a show this year in the South of England; and as the Society had not visited Kent for thirty-nine years, that county had a special claim upon their consideration. The Society had received a very cordial welcome from Kent and its capital town, and everything possible was done by the local authorities to make the meeting a success—which, indeed, in every respect but the financial, it undoubtedly was. The Council had already decided to remit to a Special Committee consisting of the Chairmen of the several permanent committees concerned in the administration of the shows, with the Honorary Director and three unofficial members of the Council to be nominated by the Committee, the question of any modifications or alterations in the present show system which they might consider desirable after the present rotation was completed in 1902; and that Committee would, no doubt, give its careful and deliberate attention to the problem of minimising as far as possible the financial risks to this Society incurred by the holding of shows under the present system.

The Hon. CECIL T. PARKER said, with reference to the last part of Sir Nigel Kingscote's speech, that the Special Committee had had a preliminary meeting yesterday, and had co-opted Sir Walter Gilbey, Mr. Marshall, and Mr. Stanyforth as members of the Committee. They would be extremely glad to receive from members of Council, or others, any suggestions for the better administration of the shows in future, so that the Committee might carefully consider them at their first formal meeting to be held on December 4.

House.

Sir NIGEL KINGSCOTE (Chairman) reported that various accounts in connection with the house had been passed, and other details considered.

Journal.

Sir JOHN THOROLD (Chairman) reported that the September number of the Journal had been duly published and issued to Governors and Members. He also laid upon the table copies in pamphlet form of an article on the "Making of the Land in England," by Mr. Albert Pell, which had appeared in the Journal. Various accounts for printing, contributions, &c., had been passed for payment, and the Committee recommended that the hearty

thanks of the Society should be sent to Mr. Whitehead for his able article on the "Agriculture of Kent" in the current number of the Journal. A letter had been received from the Société des Agriculteurs de France as to the preparation of a Memoir of British Agriculture by this Society for the Paris Exhibition of 1900, but the Committee were unable to recommend the necessarily large expenditure involved in the production of a Report such as that contemplated by the French Society. The contents of the next number of the Journal had been carefully considered, and directions as to suggestions for articles and notes had been given to the Editor. The Committee had requested the Secretary to prepare a Memoir of Mr. Philip Pusey, one of the Founders of the Society, and the first Editor of the Journal, for inclusion in the number of the Society's Journal for March, 1900.

Chemical and Woburn.

Mr. STANYFORTH (Chairman) reported that the Committee had decided that the analysis of cream should be added to Members' privileges of chemical analysis, the fee chargeable therefor to be the same as that charged for analysis of milk, viz. 5*s.* per sample. Dr. Voelcker and Professor MacFadyean had been requested, on behalf of the Society, to attend the Departmental Committee appointed by the Local Government Board to inquire into the use of preservatives and colouring matters in food. The Committee gave notice that at the next meeting of the Council they would move for a renewal of the grant of 200*l.* for the Pot Culture station for 1900. Dr. Voelcker had submitted his proposals for feeding experiments at Woburn during the forthcoming season, and had presented the following report on cases of adulteration:

REPORT OF CONSULTING CHEMIST.

Inferior Quality of Basic Slag.

It is still very necessary to exercise caution in buying Basic Slag, and to check deliveries by analysis. A member of the Society bought, through a firm of local merchants, Basic Slag which had been guaranteed to him as containing 38 to 45 per cent. of phosphates, the price being 46*s.* per ton delivered. The analysis came out:—

Phosphoric acid . . .	13·48 per cent.
Equal to phosphate of lime	29·42 per cent.
"Fineness"	69·00 per cent.

This was of low quality and a coarsely ground sample. Properly ground Basic Slag should be of 80 to 90 per cent. "fineness."

Castor-oil Bean in Decorticated Cotton-cake.

A sample of kibbled decorticated cotton-cake was submitted to me early in August, which had been given to nineteen dairy cows, twelve of which were the same day seized with violent purging and lost their milk. On examination of the cake I found it to contain husks of castor-oil bean, which undoubtedly had caused the trouble. The vendors had to take the cake back and made full compensation.

Inferior Compound Feeding-cakes.

The following are instances of what is unfortunately not of uncommon occurrence, that compound cakes are of quality inferior to what they are represented as being, or contain ingredients of an unsound, unsuitable, or worthless nature.

It is well in this connection to bear in mind that the Fertilisers and Feeding Stuffs Act expressly provides against the inclusion in any "food for cattle" of ingredients deleterious to cattle, or of any which are "worthless for feeding purposes," if these latter have not been disclosed at the time of sale.

1. Mr. F. Elwess, of Scawthorpe Grange, York Road, Doncaster, sent me for analysis on September 12 a sample of feeding-cake, sold as "a compound of linseed, cotton-seed, and grain, cooked in treacle." Mr. Elwess had in June purchased 6 tons of this cake at 6*l.* per ton delivered; 4 tons had been already received, and the sample sent for analysis was taken from the next lot, delivered on September 9. With the cake was given the following guarantee of analysis: oil, 8 per cent.; albuminoids, 18 per cent.; carbohydrates, 50 per cent. My report on the sample sent me was:—

Moisture	11·80
Oil	5·26
*Albuminous compounds (flesh-forming matters) . . .	16·43
Mucilage, sugar, and digestible fibre	50·35
Woody fibre (cellulose) . .	10·12
†Mineral matter (ash) . . .	6·04
	100·00
*Containing nitrogen . . .	2·63
†Including sand . . .	2·19

"This is decidedly below the guarantee in oil and albuminoids, and, moreover, is not made from clean materials."

The manufacturer promised to look into the matter, draw a further sample, and compensate the purchaser in case the report was substantiated. He further acknowledged to having had a parcel of seed which he was dissatisfied with, and was then in dispute with the sellers about it. The examination of the further sample confirmed my original report, and the manu-

facturer allowed Mr. Elwess 3*l.* on account of the last two tons delivered.

2. Mr. F. Reynard, of Sunderlandwick, Driffield, sent, on September 22, a sample of feeding-cake, price £6 5*s.* per ton delivered. On asking for a guarantee, the following analysis was given to Mr. Reynard :—

Moisture	11·72
Oil	4·79
Albuminoids	16·83
Starch, sugar, &c.	45·41
Digestible fibre, &c.	21·18
	100·00
Nitrogen	2·66
Equal to ammonia	3·23

Mr. Reynard purchased one ton, and, after sending me a sample for analysis, received my report :—

Moisture	10·12
Oil	4·35
*Albuminous compounds (flesh-forming matters)	17·18
Mucilage, sugar, and digestible fibre	49·30
Woody fibre (cellulose)	10·91
†Mineral matter (ash)	8·14
	100·00
*Containing nitrogen	2·75
†Including sand	4·24

"A nasty gritty cake, with a quantity of weed seeds, mostly polygonum (with some cockle seed), and containing $4\frac{1}{2}$ per cent. of sand."

(Signed) J. AUGUSTUS VOELCKER.

October 31, 1899.

Botanical and Zoological.

Lord BROUGHAM and VAUX, in the absence through indisposition of the Chairman (Mr. Whitehead), reported the progress of the Grass Experiments, and of the Experiments in Eradication of Weeds, which were now being conducted under the auspices of the Society. The Committee proposed that the Zoologist's report in the December number of the Journal should include a special account of apple and pear fruit-eating insects (see page 670). The Committee gave notice that at the next meeting they would move for a grant of 50*l.* for the Grass Experiments in 1900.

Veterinary.

The Hon. CECIL T. PARKER (Chairman) reported that the Committee had had under their consideration the recommendations of the Sub-Committee appointed at the July meeting of the Council to consider the whole question of the future veterinary arrangements in the Society's showyard. These proposals included the suggestion that no animal in the horse and cattle classes should be admitted to the showyard unless accompanied by a certificate (signed by a veterinary surgeon of not less than three years' standing as a member of the Royal College of Veterinary Surgeons) of freedom from contagious disease, and in the case of horses from hereditary disease also. The recommendations of the Veterinary Committee thereon would be submitted at the December meeting of the Council. The Committee had decided that the horse-shoeing competitions at York should be thrown open to the United Kingdom, and be divided into two classes, viz.: Class 1, hunters; Class 2, cart horses. They gave notice that at the next meeting they would move for the renewal of their annual grant of 600*l.*, of which 500*l.* would be allocated to the Royal Veterinary College, and 100*l.* reserved for general purposes.

The following report had been received from Professor McFadyean:

ANTHRAX.—During the first forty-two weeks of this year 433 outbreaks, with 852 animals attacked, had been reported. The figures for the corresponding period of last year were 452 and 686 respectively.

GLANDERS.—No progress in the extermination of this disease has been made during the current year, the outbreaks for the past forty-two weeks having been 671 and the animals attacked 1,197, as against 615 outbreaks with 1,150 animals attacked during the same period of 1898.

RABIES.—Eight cases of this disease have been detected since January 1; with one exception (in Essex) all of them occurred in Wales. At the same date in 1898 sixteen cases had been reported.

SWINE-FEVER.—The returns show very little variation in the prevalence of the disease during the last two years. The outbreaks reported during the present year number 2,050, as against 2,085 at the same date in 1898, and 1,997 at the same date in 1897.

MISCELLANEOUS.—During the first three quarters of the current year 274 morbid specimens have been forwarded to the Research Laboratory at the Royal Veterinary College for examination. Judging from the reports that have reached the Laboratory, the losses among sheep from lung and stomach worms have been less serious than in the three preceding years. Some experiments bearing on the cause of African "horse-sickness" are now being carried out, and the inquiry regarding the tuberculin test is being pursued by the Committee specially appointed for that purpose in June last.

Stock Prizes.

Mr. SANDAY (Chairman) reported that, of the prize sows entered as "in-pig" at the Maidstone Meeting, the following had become ineligible owing to non-compliance with the regulations as to farrowing:—

Class 203.—Large Whites, No. 1766. First prize (Sir Gilbert Greenall's sow by Walton Eclipse).

Class 211.—Small Whites, No. 1809. First prize (the Hon. D. P. Bouverie's "Coleshill Sensation 2nd").

Class 215.—Berkshires, No. 1848. Second prize (Mr. J. Jefferson's "Peel Daisy").

The Committee accordingly recommended that the awards in these classes be altered as follows:—

Class 203.

No. 1763. First prize of 10*l.* to Mr. D. R. Daybell, for "Bottesford Satisfaction" (*originally second prize*).

No. 1764. Second prize of 5*l.* to Sir Gilbert Greenall, Bart., for "Walton Bella" (*originally third prize*).

No. 1769. Third prize of 3*l.* to Mr. Philo L. Mills, for "Miss Hollingsworth 77th" (*reserve number*).

Class 211.

No. 1813.—First prize of 10*l.* to Sir Gilbert Greenall, Bart., for "Walton Tiny III." (*originally second prize*).

No. 1811. Second prize of 5*l.* to the Hon. D. P. Bouverie for his sow by Coleshill Temple Victor (*originally third prize*).

No. 1812. Third prize of 3*l.* to Sir Gilbert Greenall, Bart., for "Walton Tiny II." (*reserve number*).

Class 215.

No. 1850. First prize of 10*l.* and champion to Mr. J. Jefferson for "Peel Jessie."

No. 1845. Second prize of 5*l.* to the Earl of Carnarvon for "Highclere 37th" (*originally third prize*).

The Committee had prepared a draft prize-sheet for the York Meeting, and had given instructions for copies to be circulated among the Council before the December meeting, when they would propose a formal resolution for its adoption.

They also recommended that the following offers of champion prizes should be accepted, with thanks:—

Hunters' Improvement Society.—A gold medal, for the best Hunter filly not exceeding three years old.

Hackney Horse Society.—Two gold medals, for the best stallion, and for the best mare or filly exhibited in the Hackney breeding classes.

Shire Horse Society.—Two gold medals for the best Shire stallion, and for the best Shire mare or filly.

Polled Cattle Society.—A gold medal, for the best animal of the Aberdeen-Angus breed.

Mr. SANDAY, in presenting this report, said that it was not usual at that stage to give details of any suggested alterations in the prize-sheet while it was under the consideration of the Committee, the customary practice being to postpone this until the December meeting, when the prize-sheet was submitted to the Council for formal adoption. But as some important questions had been discussed on the previous day, it was perhaps desirable that he should indicate the nature of the recommendations which would later on be made by his Committee. They comprised: (1) The proposed acceptance after the York Meeting of Mr. Stratton's suggestion that the competition in the cattle classes for female animals of three years old and upwards should be limited to "cows in milk," and (2) the extension to bulls and rams at the York Meeting of the principle which had already been accepted by the Council in the case of stallions, viz.: the limitation of the age of animals eligible to compete for the Society's prizes. No prizes were now given by the Society for stallions exceeding three years of age, and the Committee proposed to limit the age of bulls to four years, and to omit the classes formerly given to two-shear rams, except in the Mountain breeds of sheep.

Sir JACOB WILSON said that before the adoption of the report was put from the chair, he desired to ask Mr. Sanday whether he proposed specifically to move, at that meeting, the adoption of the recommendation of the Committee that Mr. Stratton's suggestion should be accepted.

Mr. SANDAY said that this was not his intention, as any proposal of the kind must come formally before the Council at a later date.

The report of the Stock Prizes Committee was then received and adopted.

Implement.

Mr. FRANKISH (Chairman) reported that the Committee had amended and approved the implement regulations

for the York Meeting, and they had also considered the nomination of Judges of Implements and other matters relating to the Implement department. Various matters relating to the Implement Department of the York Meeting had been considered, and instructions given thereon.

Showyard Works.

Sir JACOB WILSON (Chairman) reported that the Committee had considered the tenders for the supply of timber for the construction of the showyard at York, and recommended the acceptance of the tender of Messrs. Richard Wade, Sons, & Co., of Hull. They had also considered the question of the supply of refreshments for the meeting next year, and recommended that, subject to the arrangement of details by the Honorary Director, the Catering Syndicate, Cambridge, be again employed on the same terms as at Maidstone. Various details connected with the York Meeting had been discussed and instructions given thereon.

Selection.

Sir JOHN THOROLD (Chairman) reported the recommendation of the Committee that Lord Middleton, of Birdsall House, York, who had expressed his willingness to serve, be elected a member of Council, to fill the vacancy caused by the transference of Sir Jacob Wilson to the list of Vice-Presidents. They also reported with regret the death of M. Henry Levèque de Vilmorin, who had been an Honorary Member of the Society since June, 1890.

The formal election of Lord Middleton as a member of Council was moved by Sir JOHN THOROLD, seconded by Sir JACOB WILSON, and carried unanimously.

Mr. SUTTON, as a personal friend of their late distinguished Honorary Member, hoped he might be allowed to be the exponent of the general sense of the irreparable loss which agriculture had sustained by Mons. de Vilmorin's premature death. During his life Mons. de Vilmorin had achieved a great reputation, not only in his own country of France, but throughout the whole agricultural world, and the feeling of regret at his decease would be universal amongst all interested in the progress of agricultural improvement and research.

Education.

Lord MORETON (Chairman) presented the following report from the Committee upon the results of the recent examinations for the National Diploma in the Science and Practice of Dairying:—

REPORT ON THE RESULTS OF THE EXAMINATIONS IN DAIRYING, 1899.

The Committee have the pleasure to report that the fourth annual examination for the National Diploma in the Science and Practice of Dairying was conducted jointly by the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland in September and October last.

2. The examination for English candidates was held under the supervision of the Executive of this Society from September 25 to 28, 1899, at the Reading College and British Dairy Institute. The Examination for Scottish candidates was conducted on identical lines, but with different examination papers, at the Scottish Dairy Institute, Kilmarnock, from October 2 to 5, 1899, under the supervision of the Highland and Agricultural Society of Scotland.

3. Twelve candidates entered for the examination at Reading, and nine for the examination at Kilmarnock, all of whom were examined.

4. Of the twelve candidates examined at Reading, the following six have satisfied the Examiners, and will therefore be entitled to receive the National Diploma in the Science and Practice of Dairying:

MAUDE P. ASHBY, 110 Liverpool Road, Birkdale, Southport.

BESSIE LYON BROWN, Drumgley, Forfar, N.B.

ANDREW LOGAN, Midland Dairy Institute, Kingston Fields, Derby.

CHRISTINA M. BRYDIE MCDUFF, British Dairy Institute, Reading.

GEORGE BERNARD NICKSON, The Park Farm, Prestwich, near Manchester.

DORA ORR, The Harris Institute, Preston.

5. Of the nine candidates examined at Kilmarnock, the following five were successful:

CHRISTINA D. FLEMING, Hawkwood, Strathavon, Lanarkshire.

WILLIAM LIMOND, Broompark, Glenluce, Wigtownshire.

MARY MACDONALD, 26 Old Edinburgh Road, Inverness.

WILLIAM STEVENSON, Boghead, Mauchline, Ayrshire.

BESSIE LENNOX WILSON, Finlayston, Ochiltree.

6. The Examiner at Reading in Chemistry and Bacteriology (Dr. J. Augustus Voelcker, B.Sc.) reports that "although in only one instance has special acquaintance with the

subjects been shown, yet I have been very well satisfied with the general knowledge possessed by the candidates, only one of whom, indeed, obtained less than the qualifying marks. There was much less of the vagueness of replies which I have noticed before, indicating, as it did, very imperfect understanding of the subject-matter; and I think there has been a more intelligent grasp of the main points and facts of the sciences involved. This was especially noticeable, I considered, in the case of those candidates who had been referred back to their studies from a previous year, and the extra year's work has, I believe, been decidedly beneficial in their case."

7. The Examiners in General Dairying (Mr. John Gilchrist) and in cheese-making (Mr. William McFadyean) have presented a joint report that "the successful candidates acquitted themselves in a very creditable manner, and will no doubt give a good account of themselves in the future. On the other hand, a number came forward unprepared, and were evidently unaware of the necessity of the practical experience and study which would enable them to secure such an important Diploma. We were impressed with the earnestness of all the students who came before us, and their evident desire to qualify themselves both practically and theoretically in all pertaining to dairy work."

8. The thanks of the Royal Agricultural Society are again due to Mr. J. Marshall Dugdale, who personally superintended the examination at Reading, to the authorities of the Reading College, and to the Committee and Officials of the British Dairy Institute, for the excellent local arrangements with regard to the general conduct of the examination, and the provision of milk, cream, and utensils.

MORETON, Chairman.

October 31, 1899.

The Regulations and Syllabus for the Examination for the National Diploma in Agriculture, as settled by the Joint Board at their meeting on October 20th, were laid upon the table, and the Committee recommended that the formal approval of the Society be given to the scheme, so that the Regulations and Syllabus might be issued forthwith. Mr. Bowen-Jones had been reappointed as the Society's representative on Childe's Foundation. The Committee gave notice that at the next meeting they would move for the renewal of their annual grant of 500*l.* for the year 1900.

Lord MORETON, in moving the formal adoption of the scheme for the examination for the National Diploma in Agriculture, said that the Regulations and Syllabus now submitted for approval were the outcome of the deliberations of the delegate appointed by the Royal Agricultural Society of England and by the Highland and Agricultural Society of Scotland, to consider a plan for the holding of a joint examination to take the place of the separate examinations which had heretofore been conducted by the two Societies. The thanks of the Council were due to the members of the Joint Board for the care and attention which they had bestowed upon the preparation of the scheme, and he thought it only right to say that the English members had received throughout the greatest assistance and courtesy from their Scottish colleagues. At the meeting of the National Agricultural Examination Board, held on the 20th ult., when the Regulations and Syllabus were finally settled, practically all the members of the Board were present, and they had arrived at a unanimous recommendation in favour of the adoption of the scheme, which now, therefore, only awaited the formal approval of the two Societies to be publicly announced. The scheme provided that candidates who might pass the examination and obtain a certain percentage of the maximum number of marks would receive the Diploma, and those who obtained a higher percentage of marks, the Diploma with honours, a Gold Medal being awarded to the best candidate on the honours list. The examination would be divided into two parts, to be taken, as a rule, in two successive years.

The Regulations and Syllabus were formally adopted by the Council, and ordered to be issued forthwith.

Dairy.

Mr. J. MARSHALL DUGDALE (Chairman) reported that the Committee had considered, approved, and adopted the recommendation of the Stock Prizes Committee that the classes for Dairy Cattle should be omitted altogether from the prizes of the Society, and that the Committee had drawn up a revised schedule of prizes for butter and cheese, which they proposed for inclusion in the York prize-sheet.

Country Meeting of 1901.

Mr. SANDAY said that the Council would remember that at their last meeting they had had before them a letter from the Town Clerk of Cardiff, stating that the proposal of the Corporation to offer to the Society the use of a part of the Llandaff Fields in that town for the purposes of the Show of 1901 had been negatived at a public meeting of the inhabitants, held on July 17th. In view of this, the Council had then resolved to postpone, until that day, a final decision with regard to the invitation to visit Cardiff in 1901, leaving to Mr. Crutchley and himself, who had formed the Committee of Inspection, to act in the matter during the recess as they might think desirable in the interests of the Society. He (Mr. Sanday) had paid two visits to Cardiff in order to confer with the local authorities on the subject of adapting, for the purposes of a show-ground, the site originally proposed on the Pont-Canna Farm, and he produced a plan showing the extra ground, which by the kindness of the Marquis of Bute and his agent, Sir W. T. Lewis, had been placed at the disposal of the Society, and which the Corporation had undertaken at his (Mr. Sanday's) request to properly prepare for the purposes of a show-ground. Unfortunately the proposed show-ground was exceedingly long and narrow, extending quite a mile from the spot where the entrances would be erected to the limits of the yard; but, as a set-off against this, the site itself was practically in the centre of the town, and in close proximity to the terminus of the Great Western Railway. He was afraid the ingenuity of the Superintendent might be taxed in laying out the ground, but he did not doubt that the difficulties would be overcome. The site was not an ideal one, but was one which, under the circumstances, he advised the Council to accept.

Mr. RANSOME asked whether, in view of the length of the showyard, it would be possible to have the entrances nearer the middle of the yard.

Mr. SANDAY replied that it would not be possible to arrange for the entrances in any other position than that shown on the plan; and, in answer to a further question by Sir Nigel Kingscote, said that the Corporation had already made a beginning of the work necessary to fit the site for a show-ground; and they would, he felt sure, be perfectly ready to meet all the requirements he had indicated to them.

Sir JOHN THOROLD thereupon moved, and Mr. CRUTCHLEY seconded, that the Society's Country Meeting of 1901 be held at Cardiff, on the Pont-Canna site now offered, subject to the usual formal agreement being entered into by the Corporation, embodying the conditions recommended by Mr. Sanday on behalf of the Committee of Inspection.

Paris Exhibition of 1900.

The SECRETARY read a letter from the Société des Agriculteurs de France inviting the Society to take part in the Conference which the French Society proposed to hold in connection with the Universal Exhibition at Paris next year, and asking for the names of the Society's delegates to be communicated to them.

Earl SPENCER moved that the invitation be accepted by the Council. He thought it would be right that the Royal Agricultural Society should be represented on that occasion, though they might not be able at that stage to nominate particular delegates.

Earl EGERTON OF TATTON, as having assisted at a similar Conference, which was held in connection with the Paris Exhibition of 1878, desired to second the motion, which was carried unanimously.

Miscellaneous.

On the motion of Sir NIGEL KINGSCOTE, seconded by Sir JOHN THOROLD, authority was given for the seal of the Society to be affixed to four new certificates of Harewood House Debenture Stock.

Various letters and other documents having been laid upon the table, the Council adjourned until Wednesday, December 6th, 1899, at 12 noon.

WEDNESDAY, DECEMBER 6, 1899.

H.R.H. THE PRINCE OF WALES, K.G. (PRESIDENT), IN THE CHAIR.

Present:

Trustees.—Earl Egerton of Tatton, Sir Walter Gilbey, Bart., Colonel Sir Nigel Kingscote, K.C.B., the Duke of Richmond and Gordon, K.G., Sir John Thorold, Bart., the Duke of Westminster, K.G.

Vice-Presidents.— H.R.H. Prince Christian, K.G., Mr. H. Chandos-Pole-Gell, the Earl of Coventry, the Earl of Feversham, Lord Moreton, Mr. Charles Whitehead, Sir Jacob Wilson.

Other Members of Council.—Mr. J. H. Arkwright, Mr. Alfred Ashworth, Mr. R. C. Assheton, Viscount Baring, Mr. George Blake, Mr. J. Bowen-Jones, Lord Brougham and Vaux, Mr. Victor C. W. Cavendish, M.P., Lord Arthur Cecil, Mr. Percy Crutchley, Lieut.-Col. J. F. Curtis-Hayward, Mr. A. E. W. Darby, the Earl of Derby, K.G., Mr. J. Marshall Dugdale, Mr. S. P. Foster, Mr. W. Frankish, Mr. Hugh Gorringe, the Marquis of Granby, Mr. R. Neville Grenville, the Earl of Jersey, G.C.M.G., Captain W. S. B. Levett, Mr. C. S. Mainwaring, Mr. Joseph Martin, Lord Middleton, Mr. T. H. Miller, the Hon. Cecil T. Parker, Mr. Albert Pell, Mr. Dan Pidgeon, Mr. J. E. Ransome, Mr. Frederick Reynard, Mr. Howard P. Ryland, Mr. G. H. Sanday, Mr. Alfred J. Smith, Mr. Henry Smith, Mr. E. W. Stanyforth, Mr. Richard Stratton, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. J. P. Terry, Mr. R. A. Warren, Mr. E. V. V. Wheeler, Mr. C. W. Wilson.

Officers.—Sir Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. W. Carruthers, F.R.S., Consulting Botanist; Mr. J. E. Compton-Bracebridge, Assistant Director; Mr. R. S. Burgess, Superintendent of the Show-yard.

Professor Sir George Brown, C.B.; Professor MacFadyean.

The following members of the York Local Committee were also present: Mr. Alderman Border, Mr. Alderman McKay, Mr. W. H. Andrew, Mr. J. J. Hunt, and Mr. Francis E. Walker.

Apologies for non-attendance were received from Mr. F. S. W. Cornwallis, M.P., Mr. A. E. Pease, M.P., Mr. S. Rowlandson, and the Lord Mayor of York (Mr. Alderman Rymer).

Election of New Members.

The minutes of the last ordinary meeting of the Council, held on November 1st, 1899, having been taken as read and approved, the election of the following twenty-two members was proceeded with :—

BERTODANO, B. De .. Cowbridge House, Malmesbury.
BICKERSTETH, John .. Beachwood, Driffield.
BIRCH, Henry .. Thame, Oxon.
BOWMAN, F. H., D.Sc. .. Mayfield, Knutsford.
CHAPMAN, F. .. Beech Hill House, Wadhurst, Sussex.
DAY, Ben .. The Rookery, Chapel Allerton, Leeds.
DUNKERLEY, W. C. .. Bowdon View Farm, Hoo Green, Knutsford.
GIBSON, R. T. .. Summerhouse, Darlington.
HAWDON, Alfred E. .. Bignell, Bicester.
LANCASTER, William J. .. Putney Hill, S.W.
LANGDALE, Captain Philip .. Houghton Hall, Sancton R.S.O., Yorks.
LEE, George .. Thaxted, Essex.
MANBY, Cordy .. Wassell Wood, Bewdley.
*MARTYN, George .. Tremeddan, Liskeard.
MICHELL, H. W. C. .. Greenford Green Farm, Harrow.
NALDER, Ernest T. W. .. Orchard House, Wantage.
POPHAM, Benjamin F., M.D. .. 16 Kensington Gardens Square, W.
RAWNSLEY, Noel .. Crosthwaite, Keswick, Cumberland.
SWAN, E. Waller .. 58 Cherson Street, Odessa, South Russia.
TAYLOR, Clement E. .. 2 Rosemary Terrace, Mortlake, Surrey.
THOMPSON, Joseph L. .. Westholme Hall, Coniston-on-Tees, *viâ* Darlington.
WOOLLASTON, G. H. .. Ellern Court, Wotton-under-Edge, Glos.

* Re-instated under Bye-law 12.

Sir JOHN THOROLD, as Chairman of the Committee of Selection, form-

ally introduced Lord Middleton, who attended for the first time as a newly elected member of Council.

The reports of the various Standing Committees were then presented and adopted, as below:—

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the period ended November 30th, 1899, as certified by the Society's accountants, showed total receipts amounting to 8,056*l.* 2*s.* 8*d.*, and expenditure amounting to 7,005*l.* 2*s.* 1*d.* Accounts amounting to 2,877*l.* 1*s.* 10*d.* had been passed, and were recommended for payment. The balance-sheet for the Maidstone Meeting, as finally passed by the auditors, and showing a debit balance of 6,382*l.* 1*s.* 11*d.*, had been laid upon the table. Mr. Frankish and Mr. Cornwallis had been appointed Stewards of Finance for the York Meeting. The Committee had met nine times and made nine reports during the year.

House.

Sir NIGEL KINGSCOTE (Chairman) reported that various accounts had been passed and recommended for payment. The Committee had met six times and made five reports during the year.

Journal.

Sir JOHN THOROLD (Chairman) reported that the Committee recommended that the Journal should in future years be circulated to members by letter post, in order to ensure its prompt delivery, and to enable it to be re-directed without payment of a second postage. Permission had been given to the Technical Education Committee of the Kent County Council to reprint Mr. Whitehead's article on the Agriculture of Kent, which had appeared in the last number of the Journal. Various suggestions for articles and notes had been considered, and instructions had been given to the Editor as to the contents of the forthcoming number of the Journal. The Committee had met eight times and made eight reports during the year.

Chemical and Woburn.

Mr. STANYFORTH (Chairman) presented various accounts connected with the Society's Pot Culture Station at Woburn for payment, together with the annual report of the Consulting Chemist, which was ordered to be published in the usual manner (see page 658). Dr. Voelcker and Professor McFadyean had attended as witnesses before the Committee appointed by the Local Government Board to inquire into the use of Preservatives and Colouring Matter in Food. The Committee asked for a renewal of the grant of 200*l.* for the purposes of the Pot Culture Station for 1900. They had met eight times and made eight reports during the year.

Dr. Voelcker had presented the following report on cases of adulteration which had come under his notice since the last meeting:—

REPORT OF CONSULTING CHEMIST.

"Blue Compound" or Adulterated Sulphate of Copper.

Warnings have been given from time to time in the reports of the Chemical Committee to purchasers of "blue vitriol" (sulphate of copper) for wheat dressing, potato spraying, charlock eradication, and other purposes, that they should be careful to see that what is supplied to them is the genuine material, and not a mixture of sulphate of copper and sulphate of iron ("green vitriol") in varying proportions—a mixture sometimes sold as "agricultural sulphate of copper."

The necessity of this precaution is emphasised by the following case: Mr. A. Julian Pell, of Wilburton Manor, Ely, purchased on October 20 from a local druggist 60 lb. of blue vitriol, at a price of 3*s.* 3*d.* per 14 lb. This Mr. Pell intended to use for dressing his seed wheat, and he had it made up into 1-lb. packets, the parcel being labelled by the vendor "Blue vitriol." "Blue vitriol," it may be pointed out, should be sulphate of copper, commercially pure, and contain no admixture of sulphate of iron. On receiving from Mr. Pell a sample of the purchase, I found it to contain 30 per cent. of sulphate of iron ("green vitriol"). When Mr. Pell complained to the vendor, the latter frankly told him that he had sold it knowing it to be an adulterated article, adding, by way of excuse, that "blue vitriol" was understood in the trade to be not pure sulphate of copper, but a mixture adulterated to the extent of 20 or 30 per cent. with sulphate of iron, and that people would not pay the small extra charge for pure sulphate of copper. He had purchased it in bulk from a wholesale firm; but they, it appeared, on further inquiry, had described it not as "blue vitriol," but as "blue compound;" so the druggist was himself alone to blame

for selling it as "blue vitriol." The price, 3*s.* 3*d.* per stone, works out to £26 per ton. Mr. A. J. Pell subsequently purchased a further supply for use, and this came labelled "Genuine sulphate of copper," and was found to be so.

Coarsely ground Basic Slag.

Occasionally, through defects in the grinding machinery, basic slag is sent out too coarsely ground, and purchasers of basic slag should be careful to stipulate not only for a stated percentage of phosphoric acid (or phosphates), but also for fineness of grinding. There should be no difficulty now in stipulating that basic slag should be "sufficiently finely ground that 80 to 90 per cent. passes through a sieve having 10,000 meshes to the square inch." Omission to have such a proviso led to the following case being brought to my notice: Mr. E. Wilkin, of Dalton-on-Tees, Darlington, purchased early in November from a local agent of a large firm of agricultural merchants, 8 tons of basic slag at the price of 34*s.* 9*d.* per ton delivered, 4*s.* per ton discount for net cash. The guarantee on the invoice merely gave "containing 9 to 11 per cent. of phosphoric acid equal to 20 to 25 per cent. tribasic phosphate of lime. Minimum percentages guaranteed." Nothing whatever was said as regards "fineness." When Mr. Wilkin sent me a sample for analysis it was found to give:—

	Per cent.
Phosphoric acid	8·69
Equal to phosphate of lime	18·97
Fineness	56·00

thus being not only 1 per cent. deficient in phosphates, but also so very coarsely ground as to be not worth getting.

Inferior Compound Feeding-Cakes.

In the last report of the Committee attention was called to compound cakes not infrequently proving to be inferior or to contain ingredients of unsound, unsuitable, or worthless nature. The following are two further cases in point:—

1. Mr. W. Wheatley, of Stapleton Manor, Stapleton, Darlington, sent, on September 14, 1899, a sample of compound cake, of which he had bought two tons at £6 7*s.* 6*d.* per ton delivered.

The purchaser complained that his young calves and lambs would not eat it, and so he sent me a sample for analysis. My report was:—

Moisture	11·40
Oil	4·36
*Albuminous compounds (flesh-forming matters)	17·45
Mucilage, sugar, and digestible fibre	47·92
Woody fibre (cellulose)	10·31
†Mineral matter (ash)	8·56
	100·00
*Containing nitrogen	2·79
†Including sand	4·48

"I am not surprised at your stock not liking this cake. It is a nasty-tasting one, being both bitter and acid, and it is largely made up of inferior and refuse grain, with much polygonum and other weed-seeds. It seems to me to have a good deal of 'sweepings' in it, as the 4½ per cent. of grit and sand in it would indicate. The price, 6*l.* 7*s.* 6*d.* per ton, is an unwarrantable one for such a cake—one which, however, it would be far better to have nothing to do with." An allowance of 50*s.* on the two tons was given.

2. Mr. J. Maddison, of Foxberry, Aldbro', Darlington, sent, on October 2, a sample of feeding cake, on which I reported as follows:—

Moisture	12·09
Oil	6·25
*Albuminous compounds (flesh-forming matters)	17·81
Mucilage, sugar, and digestible fibre	45·79
Woody fibre (cellulose)	9·88
†Mineral matter (ash)	8·18
	100·00
* Containing nitrogen	2·85
† Including sand	3·69

"This cake—composed mainly of cotton seed, locust, small wheat, rice, and malt-combs—is not as free from weed seeds as it should be, and it has considerably more sand than such a cake should contain."

(Signed) "J. AUGUSTUS VOELCKER."

December 5, 1899.

Botanical and Zoological.

Mr. WHITEHEAD (Chairman) reported that the annual reports of the Consulting Botanist and Zoologist had been passed, and were recommended for publication in the forthcoming number of the Journal (see pp. 678 and 667). The Committee asked for a grant of 50*l.* for grass experiments in 1900. They had met eight times and made eight reports during the year.

Veterinary.

The Hon. CECIL PARKER (Chairman) reported that the Committee had further considered the recommendations of the Sub-Committee on the Veterinary arrangements in the showyard, but in view of the practical difficulties which had arisen in working out the details of the proposed alteration, the Committee recommended that for next year's meeting the Veterinary arrangements in force at Maidstone should not be altered, and that the whole question should be remitted to the Special Committee at present deliberating on the Society's show system. They also recommended that Regulation 21 of the Prize List should be altered to read as follows:—

"Every exhibitor of live stock shall forfeit and pay to the Society the sum of 5*l.* as and for liquidated damages, if any animal which he sends for exhibition is, in the opinion of

the Society's Veterinary Inspectors, affected with any contagious or infectious disease, or with any form of skin disease in any stage, or with any disease which, in the opinion of such Inspectors, is likely to prove dangerous to other animals; and for each and every such case, if more than one."

The Committee had accepted, with thanks, the offer of the Worshipful Company of Farriers to present the freedom of the Company to the first-prize winners in the horse-shoeing competitions at York. They asked for a renewal of the annual grant of 600*l.* of which 500*l.* would be allocated to the Royal Veterinary College. The Committee had met eight times and had made eight reports during the year.

Professor McFadyean had presented the following report:—

ANTHRAX.—During the last four weeks, forty-three outbreaks, comprising fifty-seven cases of this disease, have been reported. The figures of the corresponding four weeks of last year were thirty-eight and sixty-one respectively.

GLANDERS.—During the same period the number of outbreaks reported was seventy-eight, and the number of animals attacked 121, as against forty-seven outbreaks and ninety-one animals attacked in the corresponding four weeks of 1898.

SWINE FEVER.—The outbreaks for the last four weeks number 107, which compare very favourably with the 159 outbreaks notified during the corresponding four weeks of last year.

RABIES.—No case of this disease has been reported since the Council last met.

MISCELLANEOUS.—The number of morbid specimens forwarded to the Research Laboratory at the Royal Veterinary College for examination and report during the month of November was forty-two, including cases of tuberculosis, anthrax, fowl cholera, cancer, and other tumours, parasitic disease of the lungs stomach and intestines, &c.

Mr. STRATTON asked if the Veterinary Committee proposed to require a veterinary certificate to be furnished with each animal sent for exhibition at York.

The Hon. CECIL PARKER replied in the negative. The arrangements for veterinary examination would be the same as at Maidstone, except that the Committee proposed that a fine of 5*l.* should be imposed upon an exhibitor for sending to the show an animal with a skin eruption, or in a state dangerous to other animals.

Mr. ASHWORTH felt that the control of the Finance Committee over the grants for scientific purposes asked for by various committees was less effective than over the other expenditure of the Society. Every account to be paid that was brought before the Finance Committee underwent a searching examination, but the granting of considerable sums to other organisations, or for particular purposes, such as that proposed in the Veterinary Committee's report, must rest upon the responsibility of the Committees asking for them and upon the Council generally, and not only upon the Finance Committee. He did not object to the grants of money that were being now asked for, but he thought such grants should not be looked upon as annuities, but should be considered as at any time open to challenge by any member of the Council.

Stock Prizes.

Mr. SANDAY (Chairman) reported that petitions had been received from English breeders of Aberdeen-Angus cattle, asking that the date from which the ages of these animals were calculated should be altered in the prize-sheet to December 1st instead of January 1st, as at present; and from a number of Yorkshire exhibitors of horses, as to a reduction in the charges for boxes, stalls, and entry fees for members, the provision of a ring in the showyard for showing horses to intending purchasers, and proposing the omission of certain regulations from the prize-sheet. The Committee could not recommend any deviation from the conditions of the prize-sheet, but had suggested that it should be referred to the Honorary Director to consider whether arrangements could be made for the showing of horses in the showyard at certain hours. The Committee recommended that the Poultry at the York Meeting should be delivered in the showyard on Saturday, June 16th, and be judged on Monday, June 18th. The Committee had considered various letters and suggestions on the subject of the prize-sheet for the York Meeting, and, having finally revised it, recommended its adoption and issue forthwith.

The Committee recommended the acceptance, with thanks, of a number of further champion prizes (see p. cxcviii).

The Committee had met eight times and made eight reports during the year.

Classes for Two-Shear Rams.

The Duke of RICHMOND and GORDON said that he understood that the Stock Prizes Committee proposed to exclude two-shear rams from competition at the Society's country meetings in future. He regarded this as a very retrograde motion. He remembered the Chairman of the Stock Prizes Committee bringing up a similar proposal in 1890, and it was decided at that time not to persist in the matter. It might be that the Chairman of the Finance Committee would tell them that it was expedient to exclude these classes from the prize-sheet because the finances of the Society were so low that they could not spare the necessary money for the purpose.

Sir NIGEL KINGSCOTE observed that the funds of the Society were not so low that anything which was really wanted for the purposes of the Society could not be supplied.

The Duke of RICHMOND was glad to hear that, because it was quite clear from Sir Nigel's interposition that the question was not one of finance; and he did not think he could do better than quote from Sir Nigel's own remarks on the same subject in 1890:[1]—"He (Sir Nigel) did not wish to enter into the question as to the ram lambs or the older sheep. His own individual opinion was against striking out the two-shear rams. He would rather see the ram lambs taken out than the two-shear rams. No one wished to see early maturity more than himself; but they gave prizes for breeding animals, not for fat ones. Many breeders kept their sheep with the prospect of showing them again, and he did not think they should now deprive them of the opportunity of competing." His Grace said he considered that the renewed proposal to strike the two-shear rams out of the prize-sheet was most unwise, and he hoped the Council would not sanction it. It would be rather hard upon sheep-breeders throughout the country if, because the Council had gone to Maidstone and lost a great deal of money, the sheep classes should suffer. The Society had led the sheep-breeders to expect these classes for a long time past, and he advised the Council to continue a course which had hitherto been uniformly successful. A ram did not reach maturity until about the age of two years. It had been said that foreigners did not care for old sheep; but this was a mistake, as he knew from his own experience that they did purchase old sheep. He begged, therefore, to move "That the prizes heretofore given by the Society for two-shear rams be continued."

Mr. J. BOWEN-JONES felt it his duty to second the resolution, as President of a Flock Book Society of some standing and utility. The opinion of the sheep-breeders on this subject had been pretty clearly expressed in the letters which had been sent to the Society asking that two-year-old sheep should not be eliminated from the prize-sheet. The general opinion of sheep-breeders had been made known through the medium of the National Sheep Breeders' Association, a body representative of the registered societies interested in sheep-breeding throughout the country; and there was no doubt a strong feeling against the proposal. He felt, with all deference to the Chairman of the Stock Prizes Committee, that it was wrong for a change of such magnitude to be made without due notice being given to those interested. He could not give his assent to a proposal which would deprive the foreigner of the opportunity of purchasing a matured animal—the animal he wanted, and the animal that suited him best.

Sir JACOB WILSON said that he did not vote upon this subject at the meeting of the Stock Prizes Committee, in view of the financial position of the Society, which he, with others interested, understood to have influenced the decision; but he had moved and carried a resolution that in the Mountain Classes the new rule should not apply. Two-shear rams were therefore included in the

[1] Journal, Vol. I., 3rd series, 1890, Appendix, p. ccvii.

Mountain Classes in the draft prize-sheet for the York Meeting. There was no doubt that the majority of rams did not come to maturity until they were two years old. Nothing could be more beautiful than some of the Southdown and Shropshire two-shear rams which had been exhibited at the Society's shows; and he should be very sorry if something could not be done to keep them in the prize-sheet. They must bear in mind that many members of the Stock Prizes Committee were not exhibitors of sheep, but at the same time he trusted that they would not ignore the interests of those who did exhibit them.

Mr. SANDAY said that it was now nine years since the Stock Prizes Committee brought up, and the Council approved, a similar recommendation to the present; and, although the alteration was afterwards rescinded at a special meeting of the Council called for the purpose, he was still of the opinion that then—when classes for ram and ewe lambs had been added to the prize-list—was the most convenient and proper time for making a change which was certain eventually to take place. Since 1890, when only very few breed societies were in existence, stud-, herd- and flock-books had been brought into being by societies representing all the principal breeds of horses, cattle, sheep, and pigs in the country. Naturally the claims of all those breeds which did not annually find a place in their prize-sheet, and which in a large national society like the "Royal" ought, in his opinion, justly to have a place there, had been, and rightly, pressed upon the Council. It would be evident to all Members of Council who considered the matter that if prizes were to be given to other breeds now omitted, except occasionally, from the prize-sheet, and if the Society's shows were to be made thoroughly representative, some of the additional prizes now in existence must be eliminated in order to keep the aggregate value of their prizes within reasonable limits. If the prize-sheet were carefully studied, he (Mr. Sanday) believed that it would be found that no classes could be omitted with so little loss either to the exhibitor or the public as those for two-shear rams; and it was upon these grounds that he wished to urge upon the Council the endorsement of the recommendations of the Stock Prizes Committee.

He was quite prepared to admit that in the case of some of the breeds a grievance might more easily be found than in others, if the recommendations of the Committee were agreed to; and he referred more particularly to the Shropshire and Southdown breeds. He was in possession of some carefully compiled statistics, from which it appeared that the average exhibits of two-shear rams in these breeds were 20·6 in the case of Shropshires and 15·30 in the case of Southdowns, as against 7·10, the highest average in other breeds (Leicesters, &c.). He could not but think that the breeders, if they recognised that the step proposed to be taken was in the interests of the Society, would subordinate their own wishes, and that they would not, therefore, press the amendment.

In pursuance of the views which he had just expressed, he wished to give notice that at the next meeting of the Council it was his intention to urge upon the Society the desirableness of including in the prize-list uniform classes for all the distinct breeds of horses, cattle, sheep, and pigs, and further that the various breed societies should have the opportunity of supplementing the prize-list through the Society, in the same manner as they were now allowed to do through the Local Committee. He thought that the time had now arrived when the unwritten rule of accepting such prizes only through the Local Committee should be done away with, as this custom was brought into existence before there were so many breed societies as at present. If the Council, for financial or other reasons, did not see their way to offer full classes for any particular breed, it should be open to the breed societies themselves, if they considered the breed of sufficient importance, to offer any additional classes they might think desirable, subject, of course, to the approval of the Council; and amongst them might be included prizes for two-shear rams.

After some further discussion, the Duke of Richmond's motion was put from the Chair, as a rider to the report of the Stock Prizes Committee, and declared carried by 25 votes to 20. With the addition of prizes for two-shear rams, the prize-sheet for the York Meeting was then formally approved.

The Hon. CECIL PARKER said he desired to obtain an expression of opinion from the Council as to whether the time had not now arrived when the colouring of sheep should be prohibited by the Society at its shows. It must have been evident to any one who had attended the Smithfield Club Show that week that some of the sheep were in a disgusting condition. He begged to move that the question be referred to the Stock Prizes Committee for consideration and report at the next meeting of the Council.

This was agreed to.

Implement.

Mr. FRANKISH (Chairman) reported that the Committee had finally approved the regulations for the exhibition and trial of implements in connection with the York Meeting. They had also approved the selection of judges for the various classes of implements for which prizes will be offered at that meeting. The Committee recommended that at the meeting of 1901 prizes be offered for a small Ice-making plant for Dairy purposes, and for portable Oil Engines. They proposed to consider the amount of the prizes to be offered and the regulations for the trials at their next meeting. The Committee had met eight times and had made eight reports during the year.

General York.

The Earl of COVENTRY (Chairman) reported that the Committee had discussed with the representatives of the York Local Committee, and had finally settled, the schedule of local prizes for live stock and produce proposed to be offered by the York Committee, and recommended their incorporation in the prize-sheet. The total amount of these local prizes was 1,676*l.* The Local Committee had nominated Messrs. Richardson and Trotter as agents for the letting of lodgings, and Mr. John Sampson, of Coney Street, York, as agent for the sale of season tickets.

Showyard Works.

Sir JACOB WILSON (Chairman) presented the Committee's recommendations as to various matters of detail connected with the York showyard. The Committee had met eight times and made eight reports during the year.

Selection.

Sir JOHN THOROLD (Chairman) reported that the Committee recommended the appointment of Mr. J. C. Williams as a Steward of Live Stock, and Mr. J. Marshall Dugdale as a Steward of Implements for the York Meeting. The Committee had met nine times and made nine reports during the year. They recommended that in accordance with the standing order passed at the Council on December 11, 1895, the Committee of Selection be constituted for the ensuing year of the President, the Chairman of each of the Standing Committees, Sir Walter Gilbey, Mr. Ashworth, and Mr. Rowlandson, and the following three new members: Mr. Crutchley, Mr. Ransome, and Mr. Wheeler, in the room of Mr. Cornwallis, Mr. Hornsby, and Mr. Terry, who retired by rotation.

Education.

Lord MORETON (Chairman) reported that the regulations and syllabus for the examination for the National Diploma in Agriculture had now been issued. It had been decided that the first examination should be held in 1900 at the Yorkshire College, Leeds, and should take place in the week commencing Monday, April 30. The Committee had met eight times and made eight reports during the year, and they asked for the renewal of their annual grant of 500*l.* for the year 1900.

Dairy.

Mr. DUGDALE (Chairman) reported that the Committee had considered the poultry prize-sheet for the York

Meeting, and had passed it, with the addition, in the Table Poultry section, of a class for a pair of cockerels and another for a pair of pullets of any cross other than those mentioned in that part of the schedule. They had also considered the appointment of judges for butter and cheese for the York Meeting, and had settled various other details connected with the dairy. The Committee had met eight times and had made eight reports during the year.

Special Show Committee.

The Hon. CECIL PARKER said that as some inquiries had been made as to when the Special Committee appointed to consider the show system (of which he was Chairman) would present their report, it might perhaps be convenient to the Council if he now stated that, although the Committee was not at present in a position to present a preliminary report, they had held another Meeting on Monday last, which was, with one exception, attended by every member of the Committee, and had made a certain amount of progress in the consideration of the questions remitted to them by the Council. The Committee proposed to hold a third meeting on Monday, February 5 next, and hoped then to be able to agree upon a first report, to be presented formally at the Council meeting on the following Wednesday, with a view to the Council deliberating at the March Meeting on the recommendations which the Committee might feel it necessary to make.

Report to General Meeting.

The draft report of the Council to the General Meeting of Governors and Members, to be held on the following day, was considered and finally settled (see page 645).

H.R.H. the PRESIDENT, in putting the motion for its approval, said that he regretted very much that an engagement of long standing, which could not be further postponed, would prevent his attendance on the following day; otherwise it would have been his duty and pleasure to have presided at the General Meeting of the members of the Society. Under the circumstances he had asked his noble friend, Lord Coventry, as ex-President, to take the chair.

Standing Committees for 1900.

The following Standing Committees were appointed for 1900:—Finance, House, Journal, Chemical and Woburn, Botanical and Zoological, Veterinary, Stock Prizes, Implement, Showyard Works, Selection, Education, Dairy.

The present members of the various Standing Committees were (with some exceptions) reappointed to those Committees. Viscount Baring, Lord Middleton, and Mr. Crutchley were added to the Stock Prizes Committee, Mr. R. C. Assheton to the Implement and Dairy Committees, and Viscount Baring, Mr. Hugh Gorringe, and Mr. Harold Swithinbank to the Veterinary Committee.

Committee for Selection of Judges.

On the motion of Sir JACOB WILSON, seconded by Mr. CRUTCHLEY, a Committee was appointed to recommend judges of stock, poultry, and produce at the York Meeting, such Committee to consist of the members of the Stock Prizes Committee and the Stewards of the several departments, and to sit for the first time in February next.

Miscellaneous.

On the motion of Sir NIGEL KINGSCOTE, seconded by Sir JOHN THOROLD, the Society's seal was authorised to be affixed to two new certificates of Harewood House Debenture Stock, and to other documents.

A letter from the Secretary of the National Agricultural Union as to a proposed Agricultural Congress in London next June was, on the motion of the Duke of RICHMOND AND GORDON, seconded by Sir NIGEL KINGSCOTE, ordered to lie upon the table.

Other business having been transacted, the Council adjourned over the Christmas recess until Wednesday, February 7th, 1900.

Proceedings at Half-yearly General Meeting of Governors and Members,

HELD AT THE SOCIETY'S HOUSE, 13 HANOVER SQUARE, LONDON W.

THURSDAY, DECEMBER 7, 1899.

THE EARL OF COVENTRY (EX-PRESIDENT) IN THE CHAIR.

Present :

Trustees.—The Duke of Westminster, K.G., Earl Egerton of Tatton, Sir Walter Gilbey, Bart., Sir John Thorold, Bart., Colonel Sir Nigel Kingscote, K.C.B.

Vice-President.—Sir Jacob Wilson.

Other Members of Council.—The Marquis of Granby, the Earl of Derby, K.G., Viscount Baring, The Hon. Cecil T. Parker, Mr. R. C. Assheton, Mr. Alfred Ashworth, Mr. J. Bowen-Jones, Mr. Victor C. W. Cavendish, M.P., Mr. Percy Crutchley, Lieut.-Colonel J. F. Curtis Hayward, Mr. W. Frankish, Captain W. S. B. Levett, Mr. C. S. Mainwaring, Mr. Henry D. Marshall, Mr. Frederick Reynard, and Mr. J. P. Terry.

Governors.—The Right Hon. Walter H. Long, M.P., Sir John Swinburne, Bart., Mr. W. F. Holt-Beever.

Members.—The Earl of Verulam, Sir Edmund Verney, Bart., Professor Sir George Brown, C.B., Messrs. George Adams, A. Bowerman, Thomas Carrick, A. C. Cope, S. H. Cowper-Coles, H. S. Daine, H. Denis de Vitré, T. H. Elliott, C.B., William Fortune, E. H. Godfrey, H. J. Greenwood, Samuel Kidner, Frederick King, Professor J. McFadyean, Messrs. W. G. McLaughlin, J. R. Markby, J. H. Master, C. Middleton, Captain W. E. F. O'Brien, Messrs. Edgar S. Peachey, William Perkins, Charles T. Scott, R. A. Hamilton Seymour, C. Franklin Simmons, C. L. Sutherland, C.I.E., John Thornton, C. W. Tindall, Edward Trimen, A. T. Walmisley, T. P. Wilkes, Ellwood Wilson, John Woodville, and G. D. Yeoman.

Officers.—Sir Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. J. E. Compton-Bracebridge, Assistant Director; Mr. R. S. Burgess, Superintendent of the Showyard.

The CHAIRMAN, in opening the proceedings, said that in taking the Chair, by the desire of His Royal Highness the President, he had it in command from the Prince of Wales to express to the assembled members His Royal Highness's great regret that an engagement of long standing, which it was impossible further to postpone, had prevented his attendance there that day; otherwise, to use the Prince's own words, "it would have been his duty and pleasure to have presided" over their gathering. Considering the many and pressing claims upon the time of the Prince of Wales, he (Lord Coventry) was sure that every member present would recognise how greatly the Society was indebted to His Royal Highness for the constant interest he took in its affairs. (Cheers.)

The SECRETARY having read the principal paragraphs of the report of the Council for the past half-year (see p. 645),

The Right Hon. WALTER LONG, M.P., who was very cordially received on rising to move the adoption of the Report, said it would be unnecessary

for him to trouble the Meeting with more than a few words. It was perhaps inevitable that the paragraphs in the Report relating to the financial results of the Show at Maidstone, and the steps which the Council proposed to take for the future, should attract a considerable amount of attention. He expressed the very earnest conviction, however, that the Royal Agricultural Society had acted wisely and well in holding the Show at Maidstone and in running the risk, to which they were quite alive at the time, and which unfortunately turned out to be a very serious one. The direct and indirect results which would follow from the demonstration in a part of England, where the show was not so familiar as it was in some other parts of the country, would unquestionably be beneficial to agricultural interests both in Kent and elsewhere. The loss which the Society had sustained was undoubtedly a very serious one; but in other respects members need not feel that their money had been unwisely spent, or without some good and practical reward. (Hear, hear.) At the same time it would not do for the Society to repeat very often an experiment which was so thoroughly agricultural in its character (laughter); and the appointment of a Special Committee to deliberate upon the Society's policy as to country meetings in the future was a satisfactory assurance that the Council were alive to this fact. He took that opportunity, on behalf of the Department which he represented, of expressing to the Council and officers of the Society his cordial thanks for the unfailing support which they gave the Board of Agriculture in the discharge of duties which were by no means easy, and in the efforts which the Board were constantly making to advance the interests of Agriculture. The Board knew that they could always look with confidence to the Council of the Royal Agricultural Society for generous consideration of their efforts, and warm support of their actions, when it was believed that they tended in the right direction. (Cheers.) He begged to move the adoption of the Report.

Mr. C. L. Sutherland, C.I.E., seconded the motion.

Mr. Christopher Middleton said he was very glad to learn that the Council intended to offer prizes next year for Dairy Cattle. Numbers of people were interested in that class of stock, and he thought that that branch of farming ought to be represented at the Society's shows. He hoped it would not be relegated to a subordinate position.

Sir John Swinburne asked the Council if they could take some steps towards the eradication of horse sickness, which was very prevalent in one of the British colonies; and hoped that they would offer prizes at the forthcoming show at York for the best oil engine intended for farm purposes, not a self-propelling implement, but an engine worked by petroleum. He would like, also, to ask the Council if they could not see their way to circulating this Report some days before the General Meeting. The Report was of considerable interest, and if his suggestion could be adopted, it would afford members time to analyse it perfectly before the actual day of the Meeting.

Mr. Samuel Kidner inquired whether the results of the investigations that were being carried out by the Society with regard to tuberculosis and the tuberculin test would be published in the Journal.

Mr. G. D. Yeoman said at the present time it was well known that a very large quantity of milk was sent up to London from all parts of the country at least twice a day. He would like to be informed whether the Council had ever had under their consideration the possibility or advisability of using any sort of preservative to keep the milk perfectly sweet and pure, especially in hot weather. Of course, all milksellers made use of refrigerators to keep the milk cool; but in very hot weather, it was impossible to keep the milk pure; and he had been asked to ascertain what the Council's views were on this question. One other point with regard to milk was the insufficient accommodation afforded by certain railway companies to milksellers. He had, himself, observed at railway stations big portmanteaux, leather bags, and other articles piled on the

milk-cans. This was a very dangerous practice, and he trusted the Council would be able to make such representations in the proper quarters as would ensure their milk being kept sweet and pure in the future.

The CHAIRMAN said that the points raised in the discussion on the Report should receive the careful attention of the Council. With regard to the financial loss at Maidstone, no one regretted it more than himself as President of that year, and he was quite willing to take his full share of the responsibility. He did not, however, suppose that members of the Society would think that it was from any lack of effort on the part of the officials that this loss was caused. It was obvious from the first that if the Society went to Maidstone a financial loss would be incurred, but it was not expected that it would prove so heavy as it was. He wished in conclusion to pay a very warm tribute to the efforts which had been made by the Local Committee and by the inhabitants of Maidstone generally. His Lordship then put the adoption of the Report, which was carried unanimously.

Vote of Thanks to Auditors.

Mr. THOMAS CARRICK, in moving a vote of thanks to the retiring Auditors, said he was certain that the services rendered by those gentlemen were very valuable to the Society, and he hoped that next year they might be in a position to present a more favourable report on the financial situation. He had much pleasure in formally moving "That the best thanks of the Society are due, and are hereby tendered, to Messrs. A. H. Johnson, Jonas M. Webb, and Henry Grinling, for their services as Auditors during the past year, and that they be re-elected for the ensuing year."

Mr. R. A. HAMILTON SEYMOUR, in seconding the motion, took the opportunity of observing that no one regretted more than the Maidstone Local Committee, of which he had been one of the Honorary Secretaries, the serious loss sustained by the Society as the result of their visit to Kent. They appreciated very highly the kindness of the Council in coming to Maidstone this year instead of in 1898, when such great trouble fell upon their district that the Show had necessarily to be postponed, and he thanked them very cordially for the invariable courtesy displayed by their noble President (Lord Coventry), and all concerned in the work of the Society.

The motion was then put from the Chair, and carried unanimously.

Suggestions of Members.

In response to the usual inquiry from the Chair as to whether any Governor or Member had any question to ask or suggestion to offer that might be referred to the Council for their consideration,

Sir EDMUND VERNEY said there were three subjects to which he should like to draw the attention of the Council: (1) The circulation of the Report to members before the General Meeting. He thought it was quite possible for this to be done, and it would be a great advantage in every way, for with the few minutes during which the Report was in their hands before the Meeting commenced, they could not intelligently grasp the development and progress of the different phases of the Society's work, and were therefore not in a position to pass the Report with anything like adequate discussion or criticism. (2) When a suggestion was made at a General Meeting, would it be possible for the person making it to be invited to attend the particular Committee to which it might be referred for consideration, so that the matter might be pressed home more effectually than could be done by a few cursory remarks, or in a letter? (3) He further suggested that the Council should formulate some views upon the subject of agricultural education, which was very much to the front at the present time. He was a member of a new organisation known as the Agricultural Education Committee, and he had been asked what the Royal Agricultural Society was doing in the matter. He thought the Society ought to express an opinion as to whether they wanted agricultural education at all, and, if so, whether it should be made part of

the elementary education. On this subject the Society ought to speak with no uncertain voice.

Mr. G. D. YEOMAN said that farmers were in great difficulties over the question of agricultural labour, the conditions of which seemed to have wholly changed during the past twenty years. He suggested that, in the interests of agriculture, certain modifications should be introduced into the present system, so that boys whose services would be very useful on the farm might be made available during the summer, without being hampered by a hard and fast rule as to passing a certain standard.

The CHAIRMAN promised that the points raised should receive the careful consideration of the Council.

Vote of Thanks to Chairman.

The Earl of VERULAM said that before the Meeting separated there was one resolution which it was his pleasure to move, and which he felt sure they would pass with the utmost unanimity, viz.: that a vote of thanks be accorded to the Earl of Coventry for his conduct in the Chair that day. The services which Lord Coventry had rendered as President of the Society during the past year would be fresh in their minds, and the duties of his Lordship that day had been discharged in the same admirable manner.

Mr. CHRISTOPHER MIDDLETON seconded the resolution, which was put by the Secretary and carried unanimously.

The CHAIRMAN, in acknowledging the vote, said he was very grateful for the kind expressions which had fallen from the proposer and seconder of the resolution. It was a great pleasure to him to preside over that Meeting, and whenever he had an opportunity of benefiting agriculture, in however humble a way, he was always glad to give his services.

The proceedings then terminated.

YORK MEETING, June 16-22, 1900.

Closing Dates for Receipt of Entries and Entry Fees.

IMPLEMENTS, March 15, 1900 (Post Entries March 31).

LIVE STOCK (Horses, Cattle, Sheep, Pigs):—
MONDAY, APRIL 16, 1900, at 10s. per Entry.
TUESDAY, MAY 1, at 15s. per Post Entry.
TUESDAY, MAY 15 (last day), at £1 per Late Entry.

POULTRY AND FARM PRODUCE:—
TUESDAY, MAY 1, at 2s. 6d. per Entry.
TUESDAY, MAY 15 (last day), at 5s. per Post Entry.

Double Fees throughout to Non-Members of the Society.

An Exhibitor will be permitted to make, in the Classes for Live Stock and Poultry, as many entries in a Class as there are Prizes offered in that Class.

PRIZE LIST

FOR

YORK MEETING, JUNE 16 to 22, 1900

Total value of Prizes offered (exclusive of Champion Prizes and Medals offered by Breed Societies), £6,820: of which amount £1,676 is contributed by the York Local Committee.

CHAMPION PRIZES.

The following Champion Prizes are offered by various Breed Societies, &c.:

Hunters' Improvement Society . .	GOLD MEDAL for the best Hunter Filly not exceeding 3 years old.
Cleveland Bay Horse Society .	TWO PRIZES of £10 each for the best Cleveland Bay Stallion and for the best Mare or Filly.
Yorkshire Coach Horse Society .	TWO PRIZES of £10 each for the best Coach Horse Stallion, and for the best Coach Horse Mare or Filly.
Hackney Horse Society . . .	TWO GOLD MEDALS for the best Hackney Stallion, and for the best Mare or Filly.
Polo Pony Society	GOLD MEDAL for the best Polo Pony Stallion.
Shire Horse Society	TWO GOLD MEDALS for the best Shire Stallion, and for the best Mare or Filly.
Shorthorn Society	TWO PRIZES of £20 each for the best Shorthorn Bull, and for the best Cow or Heifer.
Red Polled Cattle Society . . .	TWO PRIZES of £10 each for the best Red Polled Bull, and for the best Cow or Heifer.
Polled Cattle Society	GOLD MEDAL for the best Aberdeen Angus Bull, Cow, or Heifer.
Highland Cattle Society . . .	TWO PRIZES of £15 each for the best Highland Bull, and for the best Cow or Heifer.
Kerry and Dexter Cattle Society .	TWO CHALLENGE CUPS, value £26 5s. each, for the best Kerry Bull, Cow, or Heifer, and for the best Dexter Bull, Cow, or Heifer. The Cup to be the property of an Exhibitor winning it three years in succession.
Lincoln Long-wool Sheep Breeders' Association.	PRIZE of £10 10s. for the best Lincoln Ram.
Southdown Sheep Society . . .	PRIZE of £10 10s. for best Southdown Ram.
Suffolk Sheep Society . . .	GOLD MEDAL for best Suffolk Ram.
Wensleydale Blue-faced Sheep Breeders' Association.	PRIZE of £10 for the best Wensleydale Ram.
National Pig Breeders' Association .	FOUR GOLD MEDALS for the best Boar or Sow of the Large White, Middle White, Small White, and Tamworth breeds.
British Berkshire Society . .	PRIZE of £5 for the best Berkshire Boar or Sow.

HORSES (£2,505).

HUNTERS.

Class		Prizes 1st £	2nd £	3rd £
1	MARE, with foal at foot (15 st. and upwards)	20	10	5
2	MARE, with foal at foot (12 to 15 st.)	20	10	5
3	MARE OR GELDING (15 st. and upwards), foaled in '94 or '95 [1,2]	30	20	10
4	MARE OR GELDING (12 to 15 st.), foaled in '94 or '95 [1,2]	30	20	10
5	GELDING, foaled in 1896 [1,2]	25	15	10
6	MARE, foaled in 1896 [1,2]	20	15	10
7	GELDING, foaled in 1897 [1]	15	10	5
8	FILLY, foaled in 1897	15	10	5
9	GELDING, foaled in 1898 [1]	15	10	5
10	FILLY, foaled in 1898	15	10	5
11	COLT OR GELDING, foaled in 1899 [1]	15	10	5
12	FILLY, foaled in 1899	10	5	–

HACKS.

13.	MARE OR GELDING, for riding (not over 15 hands), foaled in '94, '95, or '96 [1]	15	10	5

CLEVELAND BAYS.

14	STALLION, foaled in 1897 [1]	15	10	5
15	STALLION, foaled in 1898	15	10	5
16	MARE (with foal at foot)	15	10	5
17	GELDING, foaled in 1897 [1]	15	10	5
18	GELDING, foaled in 1898 [1]	15	10	5
19	FILLY, foaled in 1898 [1]	15	10	5
20	COLT OR GELDING, foaled in 1899 [1]	15	10	5
21	FILLY, foaled in 1899 [1]	15	10	5

COACH HORSES.

22	STALLION, foaled in 1897 [1]	15	10	5
23	STALLION, foaled in 1898	15	10	5
24	MARE (with foal at foot)	15	10	5
25	GELDING, foaled in 1897 [1]	15	10	5
26	GELDING, foaled in 1898 [1]	15	10	5
27	FILLY, foaled in 1898 [1]	15	10	5
28	COLT OR GELDING, foaled in 1899 [1]	15	10	5
29	FILLY, foaled in 1899 [1]	15	10	5

HACKNEYS.

30	STALLION, foaled in 1897, 15 hands and upwards	15	10	5
31	STALLION, foaled in 1897, above 14 hands and under 15 hands [1]	15	10	5
32	STALLION, foaled in 1898	15	10	5
33	STALLION, foaled in 1899	15	10	5
34	MARE (with foal at foot), 15 hands and upwards	15	10	5
35	MARE (with foal at foot), above 14 and under 15 hands [1]	15	10	5

HACKNEYS (*contd.*).

Class		Prizes 1st £	2nd £	3rd £
36	GELDING, foaled in 1897 [1]	15	10	5
37	FILLY, foaled in 1897 [1]	15	10	5
38	GELDING, foaled in 1898 [1]	15	10	5
39	FILLY, foaled in 1898	15	10	5
40	COLT OR GELDING, foaled in 1899 [1]	10	5	–
41	FILLY, foaled in 1899	10	5	–
42	MARE OR GELDING, foaled in 1894, 1895, or 1896, to carry 15 st. and upwards [1]	15	10	5
43	MARE OR GELDING, foaled in '94, '95, or '96, to carry 12 st. and under 15 st. [1]	15	10	5

PONIES.

44	STALLION, not over 14 hds.	15	10	5
45	MARE (with foal at foot), not over 14 hands	15	10	5
46	MARE OR GELDING, 13 hands 2 inches, and not above 14 hands 2 inches [1]	10	5	3
47	MARE OR GELDING, under 13 hands 2 inches [1]	10	5	3

SHETLAND PONIES.

48	STALLION, foaled before or in 1897, not over $10\frac{1}{2}$ hds [1]	7	3	–
49	MARE, foaled before or in 1897, not over $10\frac{1}{2}$ hds [1]	7	3	–

MOUNTAIN AND MOORLAND PONIES.

50	STALLION, foaled before or in 1897, not over 13 hands 2 inches	10	5	–
51	MARE, foaled before or in 1897, not over 13 hands 2 inches	10	5	–

POLO PONIES.

52	STALLION, not exceeding 14 hands 2 inches [1]	20	10	5
53	STALLION (Eastern Sire) not over 14 hands 2 inches [1]	15	10	5
54	MARE, above 13-2 and not over 14-2 hds., with foal at foot, or to foal in 1900 [1]	15	7	3
55	COLT, GELDING, OR FILLY, foaled in 1897, not over 14 hands 1 inch [1]	10	7	3
56	COLT, GELDING, OR FILLY, foaled in 1898, not over 14 hands [1]	10	7	3
57	COLT, GELDING, OR FILLY, foaled in 1899 [1]	10	7	3

[1] Offered by the York Local Committee.
[2] A fourth Prize of £5 is offered in each of Classes 3, 4, 5, and 6.

HARNESS HORSES AND PONIES.

To be driven in Single Harness.

Class		Prizes 1st £	2nd £	3rd £
58	Mare or Gelding, any age, above 15 hands [1]	15	10	5
59	Mare or Gelding, any age, above 14 and not over 15 hands [1]	15	10	5
60	Pony Mare or Gelding, any age, not over 14 h. [1]	15	10	5

SHIRE.

Class		1st £	2nd £	3rd £
61	Stallion, foaled in 1897	20	10	5
62	Stallion, foaled in 1898	20	10	5
63	Stallion, foaled in 1899	15	10	5
64	Mare (with foal at foot)	20	10	5
65	Filly, foaled in 1897	15	10	5
66	Filly, foaled in 1898	15	10	5
67	Filly, foaled in 1899	15	10	5

CLYDESDALE.

Class		1st £	2nd £	3rd £
68	Stallion, foaled in 1897	15	10	5
69	Stallion, foaled in 1898	15	10	5
70	Stallion, foaled in 1899	15	10	5
71	Mare (with foal at foot)	15	10	5
72	Filly, foaled in 1897	15	10	5
73	Filly, foaled in 1898	15	10	5

SUFFOLK.

Class		1st £	2nd £	3rd £
74	Stallion, foaled in 1897	15	10	5
75	Stallion, foaled in 1898	15	10	5
76	Stallion, foaled in 1899	15	10	5
77	Mare (with foal at foot)	15	10	5
78	Filly, foaled in 1897	15	10	5
79	Filly, foaled in 1898	15	10	5

DRAUGHT HORSES OF ANY BREED.

(To be exhibited in Harness, on June 21 only).

Class		1st £	2nd £	3rd £
80	Agricultural Gelding, foaled in 1896 [1]	15	10	5
81	Agricultural Gelding, foaled in 1897 [1]	15	10	5
82	Agricultural Pairs [1]	15	10	5
83	Railway or Corporation Horse [1]	10	5	3
84	Tradesman's Heavy or Rulley Horse [1]	10	5	3
85	Tradesman's Light Horse [1]	10	5	3

Fourth Prizes of £3 are offered in Classes 80 to 82, and of £2 in Classes 83 to 85. Entries close May 15. Entry Fees—Members, 2s. 6d., Non-members, 5s.

CATTLE (£1,755).

SHORTHORN.

Class		1st £	2nd £	3rd £
86	Bull, calved in '96 or '97	15	10	5
87	Bull, calved in 1898	15	10	5
88	Bull, calved in 1899	15	10	5
89	Cow, in-milk or in-calf, calved in '94, '95, or '96	15	10	5
90	Heifer, in-milk or in-calf, calved in 1897	15	10	5
91	Heifer, calved in 1898	15	10	5
92	Heifer, calved in 1899	15	10	5

HEREFORD.

Class		Prizes 1st £	2nd £	3rd £
93	Bull, calved in '96 or '97	15	10	5
94	Bull, calved in 1898	15	10	5
95	Bull, calved in 1899	15	10	5
96	Cow, in-milk or in-calf, calved in '94, '95, or '96	10	5	–
97	Heifer, in-milk or in-calf, calved in 1897	10	5	–
98	Heifer, calved in 1898	15	10	5
99	Heifer, calved in 1899	15	10	5

DEVON.

Class		1st £	2nd £	3rd £
100	Bull, calved in 1896, 1897, or 1898	15	10	5
101	Bull, calved in 1899	15	10	5
102	Cow, in-milk or in-calf, calved in '94, '95, or '96	15	10	5
103	Heifer, in-milk or in-calf, calved in 1897	15	10	5
104	Heifer, calved in 1898	10	5	–
105	Heifer, calved in 1899	10	5	–

SUSSEX.

Class		1st £	2nd £	3rd £
106	Bull, calved in 1896, 1897, or 1898	15	10	5
107	Bull, calved in 1899	15	10	5
108	Cow or Heifer, in-milk or in-calf, calved in '94, '95, '96, or '97	15	10	5
109	Heifer, calved in 1898	10	5	–
110	Heifer, calved in 1899	10	5	–

LONGHORN.

Class		1st £	2nd £	3rd £
111	Bull, calved in '96 or '97	10	5	–
112	Cow or Heifer, in-milk or in-calf, calved in '94, '95, '96, or '97	10	5	–

WELSH.

Class		1st £	2nd £	3rd £
113	Bull, calved in 1896, 1897, or 1898	15	10	5
114	Bull, calved in 1899	15	10	5
115	Cow or Heifer, in-milk or in calf, calved in '94, '95, '96, or '97	15	10	5
116	Heifer, calved in 1898	10	5	–
117	Heifer, calved in 1899	10	5	–

RED POLLED.

118–122 Same as for Welsh.

ABERDEEN ANGUS.

123–127 Same as for Welsh.

GALLOWAY.

128–132 Same as for Welsh.

HIGHLAND.

Class		1st £	2nd £	3rd £
133	Bull, calved previously to or in 1897 [1]	15	10	5
134	Bull, calved in 1898	15	10	5
135	Bull, calved in 1899	15	10	5
136	Cow, in-milk or in-calf, calved before or in 1896 [1]	15	10	5
137	Heifer, calved in 1897	10	5	–
138	Heifer, calved in 1898	10	5	–

[1] Offered by the York Local Committee.

AYRSHIRE.

Class		Prizes 1st £	2nd £	3rd £
139	Bull, calved in '96 or '97	15	10	5
140	Bull, calved in 1898	15	10	5
141	Cow or Heifer, in-milk or in-calf, calved in '94, '95, '96, or '97	15	10	5
142	Heifer, calved in 1898	10	5	–

JERSEY.

143	Bull, calved in 1896, 1897, or 1898	15	10	5
144	Bull, calved in 1899	10	5	–
145	Cow, in-milk, calved in 1894, 1895, 1896, or 1897	15	10	5
146	Heifer, in-milk or in-calf, calved in 1898	15	10	5
147	Heifer, calved in 1899	15	10	5

GUERNSEY.

148	Bull, calved in 1896, 1897, or 1898	15	10	5
149	Bull, calved in 1899	10	5	–
150	Cow or Heifer, in-milk or in-calf, calved in 1894, 1895, 1896, or 1897	15	10	–
151	Heifer, calved in 1898	10	5	5
152	Heifer, calved in 1899	10	5	–

KERRY.

153	Bull, calved in 1896, 1897, 1898, or 1899	10	5	–
154	Cow or Heifer, in-milk or in-calf, calved in 1894, 1895, 1896, or 1897	10	5	–

DEXTER.

155 & 156 Same as for Kerry.

DAIRY COWS.

157	Cow, in-milk, of any breed or cross	15	10	5

SHEEP (£1,365).

LEICESTER.

158	Two-Shear Ram	10	5	–
159	Shearling Ram	15	10	5
160	Three Ram Lambs, dropped in 1900	10	5	–
161	Three Shearling Ewes	15	10	5
162	Three Ewe Lambs, dropped in 1900	10	5	–

COTSWOLD.

163–167 Same as for Leicester.

LINCOLN.

168	Two-Shear Ram	10	5	–
169	Shearling Ram	15	10	5
170	Five Shearling Rams[1]	15	10	5
171	Three Ram Lambs, dropped in 1900	10	5	–
172	Three Shearling Ewes	15	10	5
173	Three Ewe Lambs, dropped in 1900	10	5	–

OXFORD DOWN.

174–178 Same as for Leicester.

SHROPSHIRE.

179–184 Same as for Lincoln.

SOUTHDOWN.

185–189 Same as for Leicester.

HAMPSHIRE DOWN.

190–194 Same as for Leicester.

SUFFOLK.

195–199 Same as for Leicester.

BORDER LEICESTER.

200–204 Same as for Leicester.

WENSLEYDALE.

205–209 Same as for Leicester.

KENTISH OR ROMNEY MARSH.

Class		Prizes 1st £	2nd £	3rd £
210	Shearling Ram	10	5	–
211	Three Shearling Ewes	10	5	–

DEVON LONG-WOOLLED.

212	Two-Shear or Shearling Ram	10	5	–
213	Three Shearling Ewes	10	5	–

SOMERSET AND DORSET HORN

214	Shearling Ram, dropped after November 1, 1898	10	5	
215	Three Shearling Ewes, dropped after November 1, 1898	10	5	–

CHEVIOT.

216	Ram, Two Shear and upwards	10	5	
217	Shearling Ram	10	5	
218	Three Shearling Ewes, of same flock	10	5	–

BLACK-FACED MOUNTAIN.

219–221 Same as for Cheviot.

HERDWICK.

222	Ram, Two Shear and upwards	10	5	
223	Three Shearling Ewes, of same flock	10	5	–

WELSH MOUNTAIN.

224 & 225 Same as for Herdwick.

PIGS (£396).

226—229 Large White
230—233 Middle White
234—237 Small White
238—241 Berkshire
242—245 Tamworth
} For Prizes see below

In each of the above Breeds the following prizes will be given (see page cciii):

[1] Offered by the York Local Committee.

PIGS (*continued*).

Classes		Prizes 1st £	2nd £	3rd £
	BOAR, farrowed in 1898 or 1899	10	5	3
	THREE BOAR PIGS, farrowed in 1900	10	5	3
	BREEDING SOW, farrowed in 1896, 1897, 1898, or 1899	10	5	3
	THREE SOW PIGS, farrowed in 1900	10	5	3

LARGE BLACK.

246	BOAR, farrowed in 1898 or 1899	10	5	3
247	BREEDING SOW, farrowed in 1896, 1897, 1898, or '99	10	5	3

POULTRY (£274).

Prizes are offered for the best COCK, HEN, COCKEREL, and PULLET of the following Breeds:—

Classes		s.	s.	s.
248—251	Game, Old English .	30	15	10
252—255	Game, Indian . .	30	15	10
256—259	Dorking, Coloured .	30	15	10
260—263	Dorking, Silver Grey	30	15	10
264 & 265	Dorking, White or Cuckoo . .	30	15	10
266—271	Brahma and Cochin .	30	15	10
272—275	Langshan . . .	30	15	10
276—279	Plymouth Rock .	30	15	10
280—289	Wyandotte . .	30	15	10
290—293	Orpington . .	30	15	10
294—297	Houdan . . .	30	15	10
298 & 299	French (Houdan excepted) . . .	30	15	10
300—303	Minorca . . .	30	15	10
304—309	Leghorn . . .	30	15	10
310 & 311	Andalusian . .	30	15	10
312 & 313	Hamburgh . .	30	15	10
314—317	Any other breed (except Bantams) .	30	15	10

318	Aylesbury Drake . .	30	15	10
319	Aylesbury Duck . .	30	15	10
320	Aylesbury Young Drake .	30	15	10
321	Aylesbury Duckling . .	30	15	10
322	Rouen Drake . . .	30	15	10
323	Rouen Duck . . .	30	15	10
324	Pekin Drake . . .	30	15	10
325	Pekin Duck . . .	30	15	10
326	Cayuga Drake . . .	30	15	10
327	Cayuga Duck . . .	30	15	10
328	Any Breed (except Aylesbury) Young Drake .	30	15	10
329	Ditto, Duckling . .	30	15	10
330	Gander, Embden . .	40	20	10
331	Goose, Embden . . .	40	20	10
332	Gander, Toulouse . .	40	20	10
333	Goose, Toulouse . .	40	20	10
334	Turkey Cock . . .	40	20	10
335	Turkey Hen . . .	40	20	10

Class	*Table Poultry.*	Prizes 1st s.	2nd s.	3rd s.
336	Pair of Cockerels of any pure breed . . .	30	15	10
337	Pair of Pullets, ditto . .	30	15	10
338	Pair of Cockerels of an Indian Game-Dorking or Dorking-Indian Game 1st cross . . .	30	15	10
339	Pair of Pullets, ditto .	30	15	10
340	Pair of Cockerels of a 1st cross from any pure breeds (*Indian Game-Dorking and Dorking-Indian Game excepted*) .	30	15	10
341	Pair of Pullets, ditto . .	30	15	10
342	Pair of Cockerels of any Cross other than those of Classes 338 to 341 .	30	15	10
343	Pair of Pullets, ditto. .	30	15	10
	Table Ducklings.			
344	Pair of Ducklings of any pure breed . . .	30	15	10
345	Pair of Ducklings of 1st cross from pure breeds .	30	15	10

PRODUCE (£293).

BUTTER.

346 Keg or other Package of BUTTER not less than 14 lb. and under 40 lb. in weight (entries close April 16, 1900). 1st 5*l*., 2nd 3*l*.

347 Box of Twelve 2 lb. Rolls of BUTTER, not more than 1 per cent. salt. 1st 5*l*., 2nd 3*l*., 3rd 1*l*.

348 2 lb. FRESH BUTTER, slightly salted, made up in pounds — Four of 3*l*. each. Four of 2*l*. each. Four of 1*l*. each.

349 2 lb. FRESH BUTTER, slightly salted, made up in pounds, from milk drawn from Cows other than Channel Islands or Cows crossed with Channel Islands breeds. — Four of 3*l*. each. Four of 2*l*. each. Four of 1*l*. each.

CHEESE.

		1st £	2nd £	3rd £	4th £
350	THREE CHEDDAR, of not less than 50 lb. each, made in 1900 .	8	5	3	1
351	THREE CHESHIRE, of not less than 40 lb. each, made in 1900 .	8	5	3	1
352	THREE STILTON, made in 1900	5	3	2	–
353	THREE WENSLEYDALE OR COTHERSTONE (Stilton shape), made in 1900 [1] .	10	5	3	–

[1] Offered by the York Local Committee.

CHEESE (*continued*).

Class		Prizes 1st £	2nd £	3rd £
354	Three Wensleydale or Cotherstone (flat shape), made in 1900 [1]	10	5	3
355	Three Cleveland (Stilton shape), made in 1900 [1]	5	3	2
356	Three Cleveland (flat shape), made in 1900 [1]	5	3	2
357	Three Ryedale, made in 1900 [1]	5	3	2
358	Three Double Gloucester, made in 1900	5	3	2
359	Three Wiltshire (Loaf or flat), not exceeding 16 lb. each, made in 1900	5	3	2
360	Three Cheeses, of any other British make, made in 1900 (coloured)	5	3	2
361	Three Cheeses, of any other British make, made in 1900 (uncoloured)	5	3	2

CIDER AND PERRY.

Class		1st £	2nd £	3rd £
362	Cask of Cider, made 1899	5	3	2
363	One Doz. Cider, made 1899	5	3	2
364	One Doz. Cider, made before 1899	5	3	2
365	One Doz. Perry	5	3	2

HIVES, HONEY, AND BEE APPLIANCES.

Offered by British Bee-keepers' Association.

Class		1st s.	2nd s.	3rd s.
366	Collection of Hives	80	40	20
367	Outfit for Beginner	20	15	10
368	Observatory Hive (not less than 2 frames)	20	15	10
369	Frame Hive	20	15	10
370	Do. for Cottagers' use	20	15	10
371	Honey Extractor	15	10	–
372	Useful Appliances	10	–	–
373	12 Sections Comb Honey (1900), about 12 lb.	15	10	5
374	12 Sections Comb Honey ('99 or previous years), about 12 lb.	10	7/6	5
375	12 Sections Comb Heather Honey of any year, about 12 lb.	10	7/6	5
376	3 Shallow Frames Comb Honey, 1900	10	7/6	5
377	Run or Extracted Light Coloured Honey (1900), about 12 lb.	15	10	5
378	Run or Extracted Medium Coloured Honey (1900), about 12 lb.	15	10	5
379	Run or Extracted Dark Coloured Honey (1900), about 12 lb.	15	10	5
380	Run or Extracted Honey ('99 or previous years)	10	7/6	5
381	Run or Extracted Heather Honey ('99), about 12 lb.	10	7/6	5
382	Granulated Honey ('99 or previous), about 12 lb.	10	7/6	5
383	Display of Honey	30	20	10
384	3 lb. of Wax	10	7/6	5
385	3lb. of Wax, in marketable form, suitable for retail trade	10	7/6	5
386	Honey Vinegar ½ gall.	7/6	5	–
387	Mead ½ gallon	7/6	5	–
388	Other Practical Exhibits	10	–	–
389	Other Scientific Exhibits	10	–	–

[1] Offered by the York Local Committee.

IMPLEMENTS (£200).

	1st £	2nd £
I.—General Purpose Horse Power Cultivator	40	20
II.—Self-moving Steam Digger	40	20
III.—Milking Machine	50	–
IV.—Sheep-shearing Machine, to be driven by Power other than Hand Power	20	–
V.—Sheep-shearing Machine, to be driven by Hand Power	10	–

HORSE-SHOEING COMPETITIONS (£32).

(Open to the United Kingdom.)

Class I. Hunters (*Tuesday, June* 19).
Class II. Cart Horses (*Wednesday, June* 20).
Prizes amounting to 16*l.* are offered in each class.

Copies of the detailed Prize Sheet and Regulations (both for Stock and Implements) may be obtained on application to the Secretary of the Society at 13 *Hanover Square, London, W.*

MEMORANDA.

ADDRESS OF LETTERS.—All letters on the general business of the Society should be addressed to "The SECRETARY, Royal Agricultural Society of England, 13 Hanover Square, London, W." Letters addressed to officials of the Society by name are liable to be delayed.

TELEGRAMS.—The Society's registered address for telegrams is "Practice, London." *Replies by Telegraph cannot be sent unless paid for in advance, and cannot be guaranteed in any case.*

TELEPHONE NUMBER.—3675, "Gerrard."

OFFICE HOURS.—10 to 4. On Saturdays, 10 to 2.

GENERAL MEETINGS in London: Tuesday, May 22, 1900, and Thursday, December 13, 1900, at noon, at the Society's house, 13 Hanover Square, W.

MONTHLY COUNCIL (for transaction of business), at noon on the first Wednesday in every month, excepting January, September, and October: open only to Members of Council and Governors of the Society.

ADJOURNMENTS.—The Council adjourn over Passion and Easter weeks, when those weeks do not include the first Wednesday of the month; from the first Wednesday in August to the first Wednesday in November; and from the first Wednesday in December to the first Wednesday in February.

SUBSCRIPTIONS.—1. *Annual.*—The subscription of a Governor is £5, and that of a Member £1, due in advance on the 1st of January of each year, and becoming in arrear if unpaid by the 1st of June.

2. *For Life.*—Governors may compound for their subscriptions for future years by paying on election, or at any time thereafter, the sum of £50, and Members by paying £15. Members elected before 1890 may compound at any time on payment of £10 in one sum; and Members elected in or subsequently to 1890 may compound for the same amount after the payment of ten annual subscriptions. Governors and Members who have paid their annual subscription for 20 years or upwards, and whose payments are not in arrear, may compound for future annual subscriptions, that for the current year inclusive, by a single payment of £25 for a Governor, and £5 for a Member. No Governor or Member can be allowed to enter into composition for life until all subscriptions due by him at the time shall have been paid.

No Governor or Member whose subscription is in arrear is entitled to any of the privileges of the Society.

All Members of the Society are, under the Bye-laws, bound to pay their annual subscriptions until they shall withdraw from it by notice in writing to the Secretary.

PAYMENTS.—Subscriptions may be paid to the Secretary, either at the office of the Society, No. 13 Hanover Square, London, W., or by means of crossed cheques in favour of the Secretary, or by postal orders, to be obtained at any of the principal post-offices throughout the kingdom, and made payable at the Vere Street Office, London, W. When making remittances it should be stated by whom, and on whose account, they are sent. All Cheques and Postal Orders should be crossed "London and Westminster Bank, St. James's Square Branch."

On application to the Secretary, forms may be obtained for authorising the regular payment, by the bankers of individual members, of each annual subscription as it falls due. Members are particularly invited to avail themselves of these Bankers' orders, in order to save trouble both to themselves and to the Society. When payment is made to the London and Westminster Bank, as the Bankers of the Society, it will be desirable that the Secretary should be advised by letter of such payment, in order that the entry in the bankers' book may be at once identified, and the amount posted to the credit of the proper person. No coin can be remitted by post, unless the letter be registered.

JOURNAL.—The Parts of the Society's Journal are (when the subscription is not in arrear) forwarded by post to Members, or delivered from the Society's Office to Members or to the bearer of their written order.

The back numbers of the Journal are kept constantly on sale by the publisher, Mr. JOHN MURRAY, 50A Albemarle Street, W.

NEW MEMBERS.—Every candidate for admission into the Society must be nominated by a Governor or Member, and must duly fill up and sign an application for Membership on the appointed form. Forms of Proposal may be obtained on application to the Secretary, who will inform new Members of their election by letter.